April 1965

culture

SELECTED CONTENTS

Some Breeds and Crosses for Fat Lamb Production . *H. J. Bevan and A. J. Brown*

Handling Apples and Pears at Writtle . . . . *A. G. Healey*

Marketing Beef by Specifications . *D. D. Charles, R. M. Butterfield and J. Francis*

Fenland Flood Protection . . . . . *K. C. Noble*

Newent and the I.S.A. . . . . . *W. J. Wright*

Weeds in Peas . . . . . *J. M. King*

The Size of Sheep . . . . . *Gerald Wiener*

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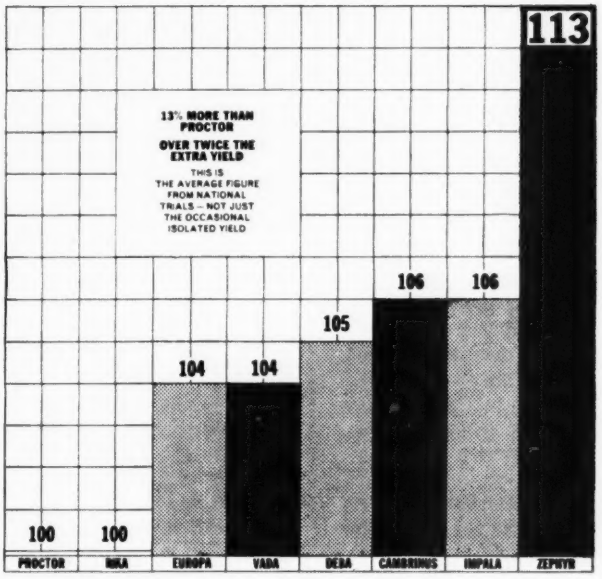

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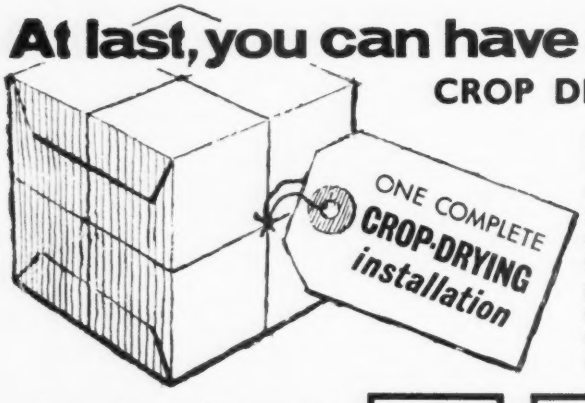

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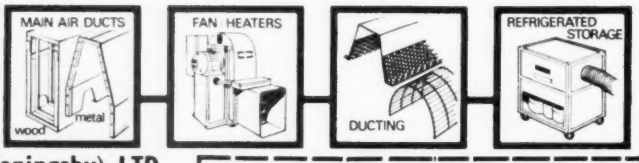

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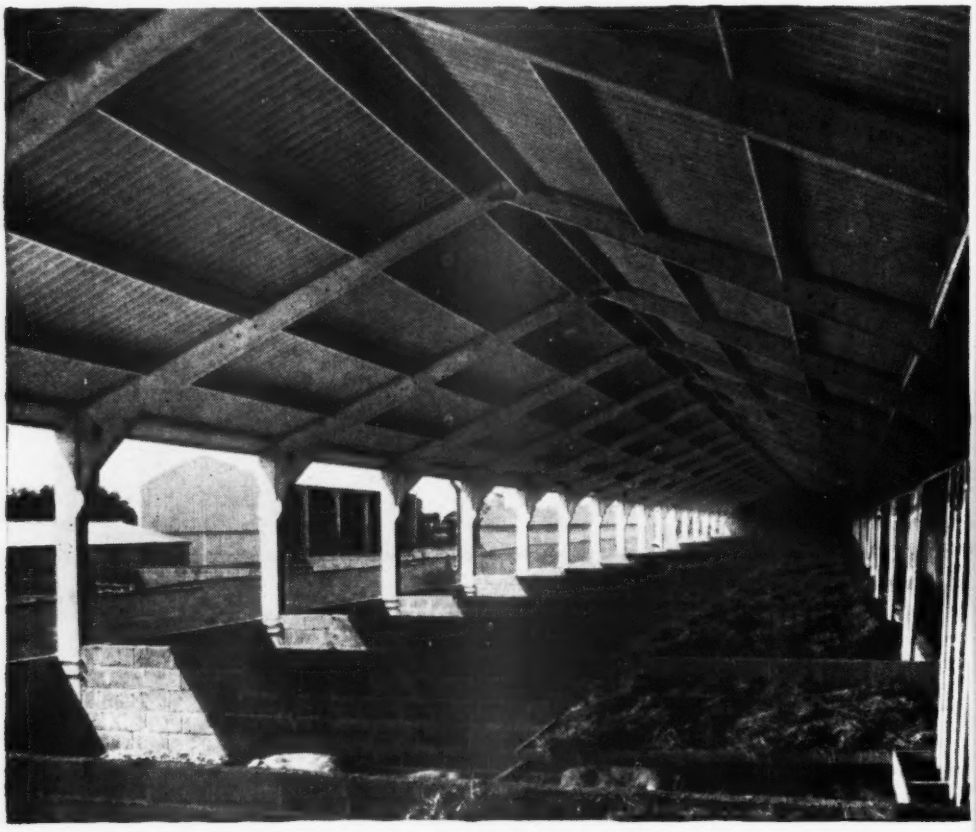

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CONTENTS

Feeding Time *Doris Court* 155
Some Breeds and Crosses for Fat Lamb Production
H. J. Bevan and *A. J. Brown* 157
Handling Apples and Pears at Writtle *A. G. Healey* . . . 162
Marketing Beef by Specifications
D. D. Charles, R. M. Butterfield and *J. Francis* 167
Fenland Flood Protection *K. C. Noble* 171
Newent and the L.S.A. *W. J. Wright* 176
Weeds in Peas *J. M. King* 181
The Size of Sheep *Gerald Wiener* 185
Vase-fresh Flowers *W. Hugh Smith* 190
Agricultural Chemicals Approval Scheme 193
Farming Cameo Series 3: 27. Ormskirk, Lancashire *J. K. Thompson* 194
From the ALS: Farrowing Houses for Pig Weaner Groups
C. Dobson 196
Short Guide to the Annual Review, 1965 198
In Brief 202
Book Reviews 205
Ministry's Publications 208

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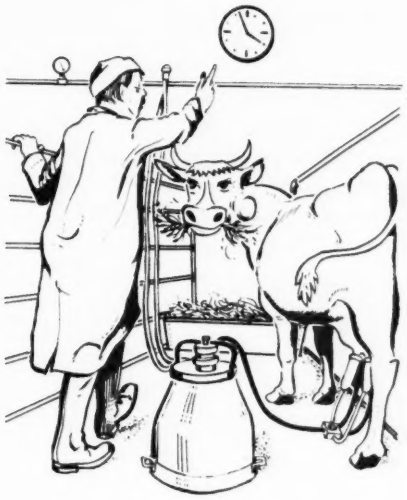


Based on a N.A.A.S. Milk Group Investigation

Doris Court

puts forward the case for two-stall one-unit milking

Feeding Time

CONCENTRATE feed is the highest single cost item in milk production, so it is not surprising that emphasis has been placed on accurate rationing according to yield. Ideas on this may change; indeed, with the bigger units capable of justifying outlay on haylage towers and moist grain silos, a slight breeze of change is already evident. But for the great majority of milk producers, careful rationing of concentrates will continue for years to come.

Obviously there is no point in rationing food unless the cow is given time to eat it. In cowsheds this is no problem, but it can be a problem in some types of parlour, particularly those having one unit to every stall. Over the last couple of years one has often heard it said by owners of this type that cows going through have realized they only had a short time in which to eat their concentrates and, as a result, they ate much quicker. This raised interesting speculation on what degree of speed could be obtained and, if this were in fact true, whether it could affect basic parlour planning. A cow can be trained to do most things, but is it possible to train her to eat faster? If this were so, then smaller, cheaper parlours could be recommended with some advantage in routine work methods.

This was one thing borne in mind in an investigation to measure the rate of eating concentrate foods planned by the N.A.A.S. Milk Group. Other points included were to determine whether the type and quantity of feed, the age of the cow, the length of time between feeds and the eating habits of the cow influenced the consumption rate. Information was collected from cowshed, two-stalls-per-unit and one-stall-per-unit installations, the only basis for selection being the type of installation and whether meal or cubes was being fed. The range of concentrate feed was from 2 to 8 lb at a milking.

Rate of eating

No support for the theory that cows eat faster in one-stall-per-unit parlours has emerged from this investigation. Neither has any significant difference been found in the eating rate between cowshed-fed and parlour-fed cows, or between different types of parlour. It could be that where quick eating had been noticed in some one-stall-per-unit parlours, some degree of selection had been made. One theory put forward has been that the fast feeder could be the fast milker, and selection for one has automatically led to the other, with greater benefit in this particular type of parlour. No observations on this factor have been made, but it might prove a rewarding further study.

Certainly, there is substantial variation between individual cows—for example, times recorded for 42 different cows to eat 4 lb of meal, varied between 2 and 10 minutes.

The type of concentrate does affect the rate of eating—cubes are eaten faster than meal. During the investigation, records were kept of the size, shape and hardness of cubes and the fineness of meal, but no conclusive information was obtained and more work needs to be done on this.

The quantity fed affects the rate of eating—larger quantities are eaten relatively more quickly. For example, the average rate of eating cubes is 1·18 min per lb, but for 2 lb the rate was 1·73 min per lb, while for 8 lb the rate was 1·06 min per lb. Similar results were obtained for meal; whereas the average is 1·75 min per lb, the rate for 2 lb was 1·94 min and for 8 lb 1·42 minutes. It was reckoned that at least 20 lb of concentrates could be fed per day without the rate of eating declining.

The age of the cow affects her rate of eating—older cows eat more quickly, the eating time being reduced by 0·3 min in each successive lactation.

The interval between bulk and concentrate feeds affects the rate of eating—the rate is depressed if large quantities of bulk feeds have been eaten shortly before. Where bulk feeds had been fed less than one hour before, the eating rate was found to be half a minute slower over all levels of weight fed than that of the 'over three hours' interval group.

In the parlour-milked herds no significant difference was found between the rate of eating in front and side mangers.

Choice of parlour

The results obtained have been used to decide the basic type of parlour required for different yielding herds. Assuming concentrates are fed at 4 lb to the gallon, then a two-stall-per-unit parlour gives adequate feeding time for all yields, with the exception of meal fed for every gallon.

In a one-stall-per-unit parlour adequate feeding time for meal is only achieved where the first two gallons are obtained outside the parlour. With cubes, the first 1–1½ gallons needs to be obtained from the bulk foods to give adequate concentrate feeding time at milking.

The increased emphasis on production of better quality bulk foods will eventually have some bearing on parlour choice, if only one could rely on the weather and a uniform product from year to year. Until this is achieved most dairy farmers are still going to choose the more flexible two-stall-per-unit type of parlour.

Miss Doris L. Court, N.D.D., is a Dairy Husbandry Adviser in the Northern Region of the N.A.A.S. and is stationed at Carlisle.

H. J. Bevan

and

A. J. Brown

Some Breeds and Crosses for Fat Lamb Production

HAVE we not too many breeds of sheep; and all these modern crossings—are they justified and, if so, how successful are they likely to be? These are questions currently in the minds of many people.

The main objective of the English sheep industry is the production of meat, mostly fat lambs from lowland farms. This system depends upon the annual drafting of commercial ewes of pure or cross breeds from the hills to the lowlands, where they are crossed with a Down ram. Some farms on the better uplands have attempted to improve their turnover by going in for fat lamb production, but this is not something to be advocated. It would be better for these farms to concentrate on increasing prolificacy by improved management and nutrition, possibly with winter housing and indoor lambing under extreme conditions, but still retaining hardiness and the will to forage when keep is plentiful.

Border Leicester

One of the best known sheep breeds is the Border Leicester now used extensively for crossing on many other breeds, providing 'half-breds'. The most famous and numerically most important is the true half-bred—a cross between a Border Leicester ram and a Cheviot ewe, now usually referred to as a Scotch Half-bred.

The outstanding merits of the Border Leicester have led to its being used for crossing with many other breeds, providing breeding ewes for fat lamb production. Some of the outstanding crosses are with the Welsh Mountain, giving increased size and great hardiness in the progeny, the Welsh Half-bred.

The Border Leicester ram has also been crossed successfully with sheep from widely differing geographical and climatic conditions, ranging from the Exmoor Horn on the high land of Exmoor to the Dorset Horn on the fertile fields of Dorset and Hampshire, and even on the Devon Longwool to give a half-bred of outstanding quality. Other rams used for crossing with mountain and hill ewes, for the improvement of size, fecundity, fleshiness, milkiness and wool, are the Wensleydale, Teeswater and Kerry Hill; but these crosses are not usually seen in the South-western part of the country.

The choice of breed for lamb production will depend upon the system of farming being followed and the availability of replacement ewes. Selection of ram for mating is largely determined by the size of ewe and her milking capacity, which in turn affects the rate of lamb growth. Another important factor is the weight at which lambs are to be marketed. In some places the demand is for a heavier animal than the 30–40 lb carcass lamb, provided the quality is good. These heavier lambs give a much better return for little extra expenditure.

South Down

The outstanding Down breed is the South Down, originating from the chalklands of Sussex. It is outstanding for the quality of the lamb carcass and wool; it has been used in New Zealand for the production of high quality fat lamb. Many of the Down breeds have benefited from the judicious use of this breed. But it is relatively small, and for crossing with Scottish and Welsh Half-breds or Greyfaced ewes, the other Downs breeds such as the Dorset Down or Suffolk are usually preferred for fat lamb production. The South Down crosses well, however, with the larger breeds such as the Kent or Romney Marsh.

Dorset Horn

For extreme lowland conditions and the production of out-of-season fat lambs or even two crops of lambs, the Dorset Horn and the Dorset Down are outstanding. A peculiarity of these breeds is that they do not suffer from the limitation of mating only in Autumn and, under ideal conditions, Dorset Horn ewes are usually tupped in May to lamb in September whilst there is still plenty of grass. Given a good milk supply, such lambs can be fat for Christmas. Sometimes the Dorset Down ewes will lamb in November and December, occasionally even earlier—like the Dorset Horn.

In East Devon the Dorset Horn ewe is often crossed with the Dorset Down ram to give a fleshier type of lamb. Under extreme lowland conditions in a favourable autumn, their lambs do well on grass leys, but in the late autumn the grass must be supplemented with hay, roots and greencrop. And these foods must be continued throughout the winter until the grass comes again.

Exmoor Horn

The Exmoor Horn, derived from the Porlock Horn, is native to the upland areas of North Devon and West Somerset and is very hardy, although of course not comparably so to the Scotch Blackface or North Country Cheviot. However, in the severe winters of 1947 and 1963 they survived well, mainly on account of their natural instinct to forage for roughage of any kind. The ewes have unique wool and fleshing qualities and still retain hardiness. They

The ewes get supplementary feeding.
Recorded Dorset Down ewe with December-born twins (Colyton, Devon)

have been used for crossing with a Border Leicester ram to produce a half-bred, which is well liked for further crossing with a Down ram for fat lamb production on the lower land. The ram most favoured is the Dorset Down. This half-bred has proved prolific both in lamb and wool production and is meeting with ever-increasing demand. Pure-bred lambs are also sold in late autumn for autumn feeding.

Devon Closewool

The Devon Closewool, originating from a cross between the Devon Longwool and the Exmoor Horn, has for many years been carefully selected and stabilized. The Closewool is primarily a hardy grassland sheep, with a deep body. Besides giving a clip of about 8 lb of good quality fleece, when crossed with a ram of a Down breed, first quality fat lambs are produced. If kept on rich pastures careful shepherding is necessary to prevent the ewes becoming too fat during the autumn, which can give rise to trouble at lambing time. The ewes are crossed extensively with the Border Leicester, and this half-bred, of great scale with good fecundity and furnishing a heavy wool clip, has become very popular.

Devon Longwool

One of the oldest breeds in the West Country is the Devon Longwool. It is found mainly on the Culm Measures—the wetter part of Devon and in north-east Cornwall—and has a heavy curly fleece, with a staple of up to 12 inches. Fleeces usually average about 14 lb or over. Because of heavy wool production, the lambing percentage is not as high as with some other breeds. The ewes are usually crossed with Dorset Down, Hampshire Down or Suffolk rams for fat lamb production. Crossings have been made with a Border Leicester ram to produce a very good type of half-bred, and this appears to have a good future in these parts of the West Country where the wool clip is favoured.

Dartmoor Greyface

The ancient breed of Dartmoor Greyface, indigenous to the upland areas adjacent to the granite mass of Dartmoor, is not, as many suppose, a true hill sheep, but a hardy long-woolled type capable of finding subsistence on the poorer pastures near the moor. The sheep are covered with a long, curly lustre wool, fleeces averaging 15 lb or more. The lambs have a reputation for their high proportion of lean meat.

Work is in progress at the Devon School of Agriculture where small numbers of the Dartmoor, in common with the Scotch and Welsh Half-bred ewes, are being crossed with South Down, Dorset and Suffolk rams. The study has only been going for two years; preliminary results are reported in a later paragraph.

Whiteface Dartmoor or Widecombe

This breed is another of the ancient breeds kept on the mid and southern slopes of Dartmoor. The fleece is white, has a good staple and strong crimp. The rams are horned, a feature denoting hardiness.

It crosses well with a Border Leicester ram. The resulting half-bred has a very good mothering instinct and good milking qualities. It has shown itself to be very adaptable for crossing with Down rams for fat lamb production.

South Devon

The largest of the south-west native breeds is the South Devon and is commonly found in kindly farming areas of South Devon and Cornwall. The wool is long, dense with good staple, and fleeces of up to 16 lb. A characteristic of the breed is its docility, but it requires plentiful good grazing, when it produces carcasses with a high proportion of lean meat. Crossed with a Down breed, early-maturing fat lambs of good quality can be produced. A limited amount of crossing is practised, sometimes using a Suffolk tup. Although at first the large South Devon carcass may not seem to be in keeping with modern trends, there is a demand for these both for local holiday catering and pre-packing.

Trials at Bicton

Over a period of years trials have been carried out at the Devon School of Agriculture, Bicton, East Budleigh, on the most profitable breeds of sheep to keep on its farm. This farm is in a low rainfall area of East Devon. It was found in a five years trial reported in *Agriculture* (February, 1955) that crossing either the Devon Longwool or Half-bred (Border Leicester × Cheviot) with a Dorset Down ram was much more profitable then producing pure-bred Devon Longwool lambs. Although the Longwool ewes will lamb earlier in the year, the half-bred ewes showed an ability to suckle their progeny at a faster rate than the Longwool ewes, thus enabling a higher proportion to be marketed early and fetching better summer prices. There was little difference between the fattening properties of the Dorset Down × Longwool and a Dorset Down × Half-bred hogg.

Work on breeds and crosses for fat lamb production has continued at Bicton, comparing the Scotch Half-bred, the Exmoor Half-bred and the Devon Longwool. As a result of a number of years study, for the conditions at Bicton, the Scotch Half-bred was favoured.

Two years ago further work was started under the auspices of the National Sheep Breeders' Association, comparing other breeds and crosses. These are the Scotch Half-bred, the Welsh Half-bred and the Dartmoor, using rams of the South Down, Dorset Down and Suffolk breeds. This work is still going on and has not yet been fully investigated, but preliminary results publicly demonstrated give the following pointers. The Scotch Half-bred consistently reared a high percentage (about 180 per cent) of lambs, which made good liveweight gain. Lambs from the South Down ram on the Scotch Half-bred consistently fattened early, producing carcasses of 30–40 lb dead weight, with twin lambs fattening almost as well as singles. The Dorset Down and Suffolk rams on Scotch Half-bred ewes, produced very good lambs, but the Suffolk cross easily go into a store condition if any check is experienced and may have to be kept to 90–100 lb live weight to reach a 'fat' condition.

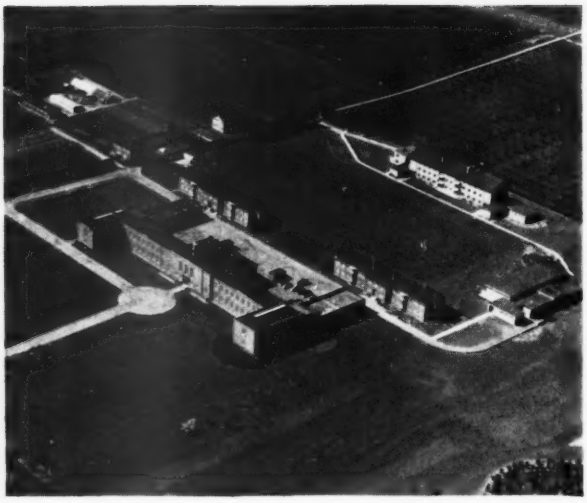
Welsh Half-breds were reported to be excellent mothers, with strong lambs but no lambing troubles. To date, prolificacy is not as marked as with the Scotch Half-bred. When crossed with the South Down, it produced a very fine type of blocky lamb, maturing rapidly but maturing at 60 lb live weight, and taking a long time to put on any additional weight. Lambs produced by the Dorset Down ram on Welsh Half-bred were a little disappointing, whilst lambs by a Suffolk ram gave a very good type of lamb, with quick growth and quick maturity, a good killing-out percentage and a carcass of about 42 lb.

The South Down/Dartmoor cross gave a good lamb, but growth was rather slow. With the Dorset Down ram, a bigger type of lamb is produced, but takes a considerable time to mature, especially twins. The Suffolk ram on a Dartmoor ewe produces a very good heavy, fat lamb with an excellent carcass, but it takes time, and in a dry area this can be a problem when summer grass is short.

Herbert J. Bevan, is the N.A.A.S. County Livestock Husbandry Officer for Devon. A farmer's son and a native of Glamorgan, he has served as a Livestock Officer with the Ministry in Devon and Cornwall since 1937 and has always had a lively concern in the livestock problems associated with hill farming in the South-West. Before joining the Ministry he was particularly interested in the breeding of Ryeland and Welsh Mountain sheep, and Beef Shorthorn cattle.

A. J. Brown, B.Sc.(Agric.), C.D.A., was brought up on a Cornish farm during the years of depression and his first appointment was with the Land Fertility Committee in 1938. He joined the N.A.A.S. on its inception and was, for several years, Senior District Advisory Officer in the Eastern area of Devon, before being promoted to Deputy County Advisory Officer in 1960, a post which he still holds.

Handling Apples and Pears at Writtle



WRITTLE from the air

The system developed at the Essex Institute of Agriculture is in many ways typical of those in use by the larger fruit growers in Essex. Mr. Healey's account may therefore be of value to others contemplating mechanization of this particular task

Mr. E. S. Devine's article in the September 1964 issue of 'Agriculture', which deals with the problem from a different angle, should be read in conjunction with this contribution

A. G. Healey

ABOUT 20,000 bushels of apples and pears are picked at Writtle in most years. Like other growers, we have found it increasingly difficult to handle fruit in the traditional way because of the shortage of male labour capable of lifting the weights involved, first at loading and subsequently at grading and storage. In any case most of our full-time permanent male staff is required in the field to supervise the women pickers, so the job of carting in and stacking had to be done on overtime by men already tired. Inevitably the fruit was not handled gently and moving the fruit from orchard to store was slowed down.

Faced with these difficulties we decided to mechanize. Existing small storage chambers had to be converted into larger units in which a fork-lift truck could operate, and floor-to-ceiling doors added. Complete palletization was necessary and lifting devices of varying types had to be bought.

The changes can be listed in order of expense: conversion of the stores; purchase of a fork-lift truck; purchase of two tractor-mounted fork-lifts, one capable of loading lorries; the design and purchase of pallets and bulk bins; and the purchase of a hand pallet truck for use in the packing shed.

Organizing women pickers

As the main picking season approaches we enlist a number of women pickers. Work on the farm is designed to give as long a picking season as possible, beginning with strawberries, going on to blackcurrants and, with a gap, early apples. Needless to say, competition for this labour is severe. Growers are offering more and more incentives to attract and hold their pickers, including transport facilities and bonus payments of various kinds, some ingeniously contrived. In our own case we pay the basic agricultural minimum hourly rate, plus a bonus (usually 1*d.*) per bushel picked. We have not, as yet, used piece-work for apple and pear picking.

The women work in gangs of about twenty under the supervision of a permanent man, whose job it is to ensure that the fruit is picked carefully and quickly, that the boxes are properly filled, the picking tickets on which the bonus is paid are inserted in boxes and the numbers finally checked, as far as possible.

This year we adopted a system used by Mr. R. S. Edwards, of Halstead, whereby the women empty their picking buckets into boxes placed on the pallet, which is moved forward as required by the tractor-lift. This avoids asking women to move heavy loads. The chargehand must also ensure that boxes are made available and pallets conveniently stationed. To him also falls the job of controlling, as far as they can be controlled, the energy and activities of the large numbers of children who come with the pickers and who have to be kept out of mischief. I expect the larger growers have already got round to the establishment of supervised crèches for the children—but we haven't as yet reached this point.

Selective colour picking is used for the early varieties and for Worcester Pearmain, but the main crops of apples and pears are stripped in the one operation. The rate of picking varies widely according to the crop, the size of the tree and the amount of ladder work involved, and, above all, to the experience and natural dexterity of the picker. At the peak of picking last season we had sixty pickers in the orchard, and we could have done with more.

Pallets

We use 43 in. square pallets—with a sense of guilt, since this is not one of the British Standards Institute's accepted sizes, but the floor pattern of fruit stores has long been governed by the size of the standard bushel box, which in plan is 21 in. × 14 in. Since we are likely to be left with existing stores and stocks of bushel boxes for some years to come, it seems sensible to accept these limiting factors. The pallet chosen takes a floor pattern of six bushel boxes, and this in turn fits into the floor pattern of the existing stores. The pallet is designed for four-way entry so that it can be approached from any side, an important feature in picking up in the orchard or in the close confines of the store. The cost of pallets has varied in the last few years from 26*s.* to 36*s.* 6*d.*

Each pallet is loaded five boxes high (except for special stacking) giving a unit load of thirty bushel boxes. It pays to be lavish with pallets, one never seems to have enough in the height of the season.

Empty picking boxes on pallet and transporter

Transporters and tractor lifts

The pallets are so arranged in the tree rows that a tractor can approach each squarely and the fork of the lift enter readily into the 4 in. clearance. We have two lift devices. One is essentially a transporter, designed to give ground clearance only, and costs, complete with the necessary front weights, approximately £100. The second unit is similar but can lift a load of one ton to a height of six feet, so that it can be used for loading trailers or lorries in the field, and it can function where it is impossible to use a normal fork-lift truck. This costs approximately £260.

Where the orchard is some distance from the fruit stores it may well be desirable to life the pallet units by tractor lift on to a trailer so that, say, three or four units are carted in one load. We have also found it particularly useful where we have to send fruit away from the farm when storage is hired elsewhere. In this case the problem is to make sure that the pallets are returned. Both these devices have worked very well and are being developed for general transport around the farm.

The front of the tractor must be weighted to counter-balance the load. The steering tends to be light. There are machines which will allow pallet loads to be picked up both front and back, but we haven't used these because of the lack of space in a closely-planted orchard. Most of the fruit is brought from the orchard in single pallet loads of thirty and delivered to a concreted area at the packing shed, where the fork-lift truck takes over if stacking in more than one tier is required.

Fork-lift and hand pallet trucks

The fork-lift truck is the most expensive item. Our machine is a pedestrian-controlled unit with a lift of 2,500 lb to a height of ten feet. It is driven by an electric battery charged from the mains. The present cost of a new truck of this kind is approximately £1,500. This is heavy expenditure and not easy to justify on a small unit. Factors other than economic ones come into this consideration, however, because if a job has to be done and the manual labour is not there to do it, then buying mechanical equipment at an uneconomic price may be the only way out of the problem. After four years' experience

we have found our truck to be reliable and relatively trouble-free, and from the experience of other fruit-growing friends it would seem that this applies to most makes.

Our converted stores are loaded fourteen boxes high. The first unit is five boxes high, the second four and the final one five, so reducing the height of lift required for the final tier. Manoeuvring and stacking in our smaller 2,000-bushel chamber is a work of art. Fruit not going into store but awaiting grading is stacked similarly in an adjoining barn, but here we stack fifteen boxes high, using the standard thirty-box unit. Pallet loads can be handled so expeditiously that we frequently put Worcesters into store temporarily, and replace them with Cox or Superb for longer storage.

The hand pallet truck is hydraulically operated, the pallet load being lifted just clear of the ground by manual pumping and then moved by hand and dropped in a new place. This, of course, applies only to single loads, not to stacked tiers. The hand truck has been invaluable for assisting with manoeuvring loads in confined stores, particularly near the doors, and for use in the grading room. Our unit has a lifting capacity of one ton and cost £100.

Bulk bins

So far we have been using bulk bins on a relatively small scale but we are satisfied that they can replace bushel boxes with some advantages in particular a more efficient use of storage space. There are disadvantages, including the risk of damage with the softer varieties and the problem of emptying the bins. A water flotation emptying system is a heavy expenditure for individual fruit farmers. At present we use the fork-lift truck to lift each bin to the head of the grading machine and to tip it slightly so the fruit rolls out by gravity from the gate. The price range for bulk bins is £3 10*s*. to £5 2*s* 6*d*. Most have a working capacity of around 15 bushels.

The fork-lift truck can raise 2,500 lb to a height of ten feet. Here, it is lifting a bulk bin in the fruit store

Mechanization to the full

The use of the equipment described goes wider than that of fruit handling. All our fertilizers, empty boxes and packing materials are now stacked on pallets as they arrive and are handled in these units to the point of final breaking down of the stack for use. It is a pity that we cannot load lorries for market in pallet units but the disadvantages are too great at the moment. So we continue with the old-fashioned and rather painful manual stacking and unstacking. Perhaps in the new markets of the future the unloading of lorries will be completely mechanized and we shall be spared the horrifying scenes which we have to put up with at present.

We hope that this brief account will be of interest and perhaps of some use to fruit growers contemplating further mechanization. The system has worked well and we could not have handled the heavy crops of recent years by the old methods. We stress that there is nothing novel in what we do; it is the sum total of developments brought together as a result of experience, not only ours, but of many enterprising fruit growers in Essex and other fruit-growing counties, and it is to the pioneers that tribute should be paid.

A. G. Healey, N.D.H., is Head of the Department of Horticulture and Deputy Principal of Agriculture at the Essex Institute of Agriculture, Writtle.

Charolais bulls to come in

It has been sufficiently established that the Charolais bull is a worthwhile addition to the range of crossing bulls available to producers of beef in Great Britain. Accordingly, the importation of Charolais cattle, mainly females, from France later this year will be permitted in order to establish the breed in this country.

Detailed arrangements will now be worked out in consultation with those concerned. Breeders who are given permission to import will be required to comply, at their own expense, with strict veterinary controls and to select stock of adequate quality. Strict control of the movement of imported stock and their progeny will have to be maintained for some years as a precaution against the spread of any genetic defects.

Marketing Beef by Specifications

Producers and producers' marketing organizations are showing an increasing interest in carcass classification.

Here is an Australian view of the subject by

- **D. D. Charles**
  Commonwealth Department of Primary Industry, Brisbane
- **R. M. Butterfield**
- **J. Francis**
  School of Veterinary Science, University of Queensland

In a recent summary of the requirements common to both local and export markets of the Australian Beef Trade, Wilson, in an Australian Meat Board Discussion Paper, set out the following desirable characteristics: a minimum of fat; a maximum of muscle; maximum weight per age; marbling without excess fat; and attractive appearance.

It is to the advantage of all concerned with the trade that a system of description of carcasses by specification should be introduced which would describe them sufficiently to allow an assessment of these characteristics to be made.

Charles, in the *Australian Veterinary Journal**, recently proposed a system of specification which gives a satisfactory description of at least the first three points mentioned above, and it is the purpose of this article to draw attention to the manner in which this scheme could operate. The specifications recommended are—sex, age, carcass weight and fat thickness, and a suitable code for recording these specifications would be:

Sex:	Bull	B	**Age:**	1, 2, 2½, 3, etc.
	Cow	C	**Weight:**	Recorded in lb
	Steer or ox	S	**Fat cover:**	1-16, representing six-teenths of an inch.
	Heifer	H		

*Charles, D. D. (1964) **40**, 27.

The recording of sex and carcass weight is normal abattoir procedure and does not require any special arrangements.

Ageing

The best estimate of age can be made from the teeth. There is some variation in age of eruption of teeth, and, although this variation delights the hearts of scientists seeking to record differences between breeds and between different environments, the amount of variation matters little in the approximation required by a system such as that proposed here. When beyond the age where teeth are of value in ageing, use can be made of the stage of ossification of the spinous processes. Although once again a certain degree of inaccuracy is inevitable, it is doubtful if this is of any importance in the trade.

To ensure uniformity throughout the industry, a formula for ageing must be laid down; a suggested basis is set out in Table 1.

Table 1

AGEING CATTLE

Teeth	Age (years)
Milk teeth	1
2 permanent teeth	2
4 ,, ,,	2½
6 ,, ,,	3
8 ,, ,,	3½
8 ,, ,, (corners in wear)	4
Changes in cartilage on dorsal extremity of thoracic spines	
Bone in any or all of 10th, 11th or 12th	4½
Bone in 6th to 9th	5
Bone in all thoracic spines	6
Almost all cartilage replaced by bone	8
Cartilage all replaced by bone	9

Each abattoir would probably develop its own system of recording the age, but most modern works are able to correlate the head with the carcass for inspection purposes. In such works it should be a simple matter to mark the carcass with the age as ascertained by the teeth.

Fat measurement

The use of a single fat thickness measurement at the level of the 10th or 12th rib provides a very useful estimate of overall carcass composition:

Table 2

RELATIONSHIP OF SUBCUTANEOUS FAT THICKNESS at level of tenth rib to CARCASS COMPOSITION

Fat thickness 1/16in.	% fat	% muscle	% bone plus connective tissue
1	10	65	25
6	19	60	21
12	28	54	18

It is suggested that this fat thickness measurement should be made at a point three-quarters of the distance from the medial to the lateral edge of the longissimus dorsi ('rib eye') muscle. This measurement is to be recorded in 1/16s of an inch. The relationship between carcass composition and fat thickness has been determined from the total dissection of over 100 carcasses of beef, derived from a wide range of cattle types. When fat thickness

is considered in relation to carcass weight, an even more accurate indication of composition is obtained, and, of course, the actual amounts of muscle, bone and fat can be calculated.

General description

While each of the specifications alone is of some value in describing beef, it is the combination of the four measurements in relation to each other which provides the best description of the carcass to the experienced buyer. Thus the association of a certain level of fatness in a carcass, of a certain weight, at a certain age and of stated sex gives a very good picture of the type of carcass being described.

We have found from a detailed dissection study of over 100 carcasses that the measurement of fat thickness is a better indication of the degree of muscle development than direct measurements of muscle cross-sections. The proposed system does not neglect the very real value of depth of muscle in determining the acceptibility of carcasses in certain markets. This is because a high weight-for-age with a low fat cover can constantly be produced only by animals with a great depth of muscle. This is demonstrated in Table 3 by the comparison of 'eye muscle' depth of yearling steers with similar fat cover but of markedly different weight.

Table 3

RELATIONSHIP OF 'EYE-MUSCLE' DEPTH TO WEIGHT FOR AGE

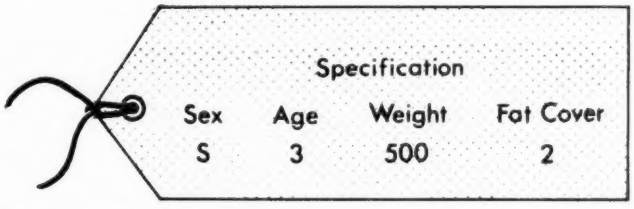
STEER	SPECIFICATIONS				
	Sex	Age	Weight	Fat thickness	'Eye muscle' depth
					in.
'Double-muscled' steer*	S	1	570	1	3·6
Store steer	S	1	460	1	2·0
Skinny steer	S	1	360	1	1·7

*The term 'double-muscled' is misleading. This animal had extremely large muscles, due to an increase in the number of fibres in each muscle, but there was no duplication of muscles.

There can be little doubt in the light of present-day knowledge that the specifications of sex, weight, age, and fat thickness will adequately take care of the requirements for conformation. A further advantage of this proposed scheme is that the specifications are entirely independent of country of origin, trade pressure, and subjective variation.

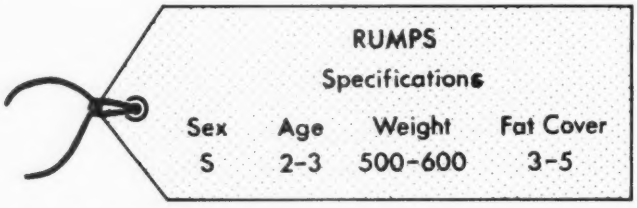
Application to trade

The specifications of a carcass can be written on a ticket attached to each quarter, such as:



If sold in quarter form this ticket would accompany the quarters to the butcher's shop. If broken up into carton beef these specifications would

allow cartons to be labelled according to the range of specifications of the beef which went into any one carton, e.g., a carton of rumps would be labelled:



Any buyer could order carcass or carton beef within a range of specifications which he could relate to the particular requirements of his consumers.

The last two features proposed by Wilson (i.e., marbling and attractive appearance) are difficult to describe. Marbled muscle is common only in association with excessive subcutaneous and intermuscular fat, and it is doubtful if any attempt to specify marbling is warranted. However, a subjective marbling score could readily be added to specifications if considered to be warranted in any particular market.

While specifications can give some indication of the attractiveness of the sample of beef, it must still be the responsibility of the trade to include in any order only those carcasses which are of an acceptable standard of attractiveness.

Application to grading

In any trade a system of grading may be based on specifications. Under these circumstances a grade name such as 'Choice' would become the abbreviated expression of a particular set of specifications. This would ensure that grades remained constant in the short term while it was desired that they should do so; on the other hand, they could readily be altered to meet long-term changes of market demand.

Under present conditions a grade of CHOICE LIGHT BABY BEEF for the trade of an Australian city could be defined by the following specifications:

Sex	Age	Weight	Fat Cover
S	2–2½	400–550	2–4

or BARLEY BEEF in the U.K. might well be specified as:

Sex	Age	Weight	Fat Cover
B or S	1	450–550	1–3

Beef which is classified by specification can vary only within defined limits of the major factors which determine its value.

Advantages to purchaser and producer

As indicated in Table 1, it is possible to correlate the specifications of any carcass with the approximate weight of muscle, bone and fat in that carcass. As buyers purchase meat for specific purposes and markets, this will enable them to relate their purchases to requirements much more accurately than any system of subjective grading. To a large extent this would be possible even for distant buyers who could not make a physical examination of their purchases. This would encourage the clear definition of classes of beef most suitable for individual markets, which in turn would encourage the production of desired types of beef.

The realization of a 300-year-old idea

Fenland Flood Protection

K. C. Noble

MAN'S struggle to protect the Fens from flooding began with Vermuyden in the seventeenth century. Three hundred years later we are still at it. The opening of the 28-mile cut-off channel last September ends the latest effort to combat the drainage problem caused by shrinkage of the peat fenland and the slow settlement of the flood embankments of the rivers crossing this area.

This cut-off channel, for the diversion of the flood waters of the rivers Wissey, Little Ouse, and Lark away from the low-lying basin of the South Level, expresses the ideas of Vermuyden in the more vigorous form proposed by Sir Murdock Macdonald in 1939, and forms the third part of an £11 million scheme. The first part was the construction of the relief channel between Denver Sluice and the new Tail Sluice adjoining King's Lynn. The second part widened and deepened the Ten Mile River and the Ely Ouse and strengthened their flood embankments.

A glance at the map on p. 173 will show the arrangement of the project.

The flood protection scheme as a whole, of which the cut-off channel is but a part, reduces the risk of flooding of some 440,000 acres of fenland, in particular the 37,000 acres of the South Level flooded in 1947. Floods of the size of those of 1912, 1936, 1937, 1947, can now be controlled, and the early 1960s saw the relief channel in use for this purpose.

The lessened risk of flooding should enable farmers in this area to plan their future cropping and capital investment with greater confidence.

The route and its problems

Preliminary surveys showed that a feasible cut-off channel would slope fairly quickly away from the River Lark at Barton Mills to a point near Eriswell. Weirs would be necessary in this length of sandy ground to control

A previous article, by G. COLE, *Flood Protection on the Great Ouse* (July, 1960), described the origins of the Fens and the consequent problems of drainage and flood protection.

the speed of the water when the channel was in use and to avoid draining all the water out from the adjoining subsoil when, as would be the case for most of the time, the channel carried no river water at all but tranquilly stood partly full.

Northward from Eriswell the channel would pass at a gentler slope from sandy peat into the chalk edging the eastern uplands before dipping under the River Little Ouse in a large U-shaped syphon. Somewhat wider to accommodate the flood water expected from the Little Ouse, its route would continue northward along the foot of the chalk to a further large syphon, passing it under the River Wissey. Thence westward, some 70 feet wid · at its base and sloping at 4 inches a mile, it would pass through sandy gravel and a deep cutting through hard clay, finally to enter the relief channel.

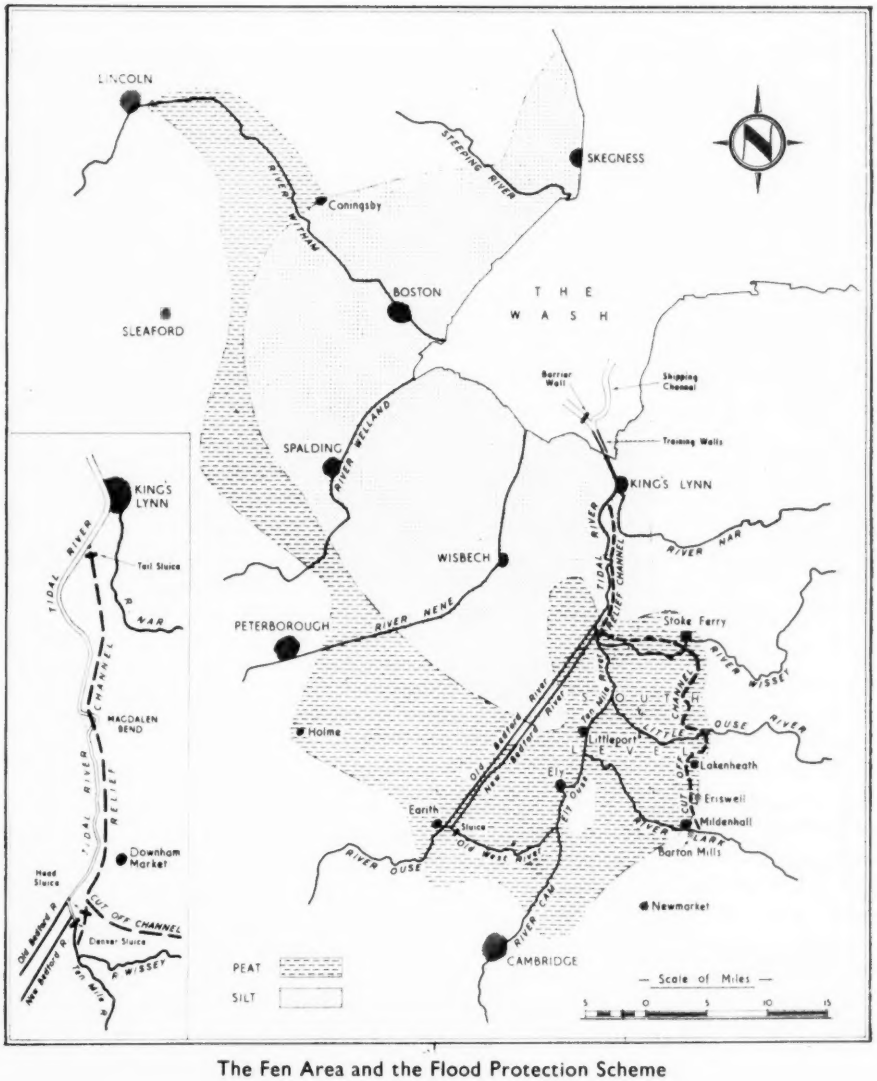
Bridges and diversions for roads and railways, the reorganization of local agricultural and house drainage, and the diversion of water, electricity and telephone services would all be necessary. In addition, some interference was to be expected with wells supplying isolated properties along the route, and piped water supplies to these properties might have to be provided. Provision would also have to be made for the preservation of footpaths and access to farms.

Construction begins

In August, 1960, the contractors started work at Denver, digging the long channel to Barton Mills and constructing thirty-one road bridges and seventeen other large structures.

Two giant walking draglines, each digging a lorry-load of earth at each swing of their buckets, began cutting the deep channel through the high ground south of Denver. Soon afterwards another pair began work some five miles to the east.

A typical road bridge. The holes in the beams are for the transverse tension wires



The Fen Area and the Flood Protection Scheme

Ahead of these great machines, smaller excavators were busy cutting ditches and channels for the temporary and permanent diversion of drainage. They also dug the deep holes in each of which a sluice, syphon, or bridge was built so that by the time the big excavators had cut the channel up to each hole, the structure it contained was virtually complete and ready for use.

Fight against groundwater

At the two syphon sites the convolutions of temporary access roads, the sharp angular outlines of derrick cranes, and the irregular outlines of the heaps of earth and white chalk dug from the three holes in which the syphon and its adjacent sluices were being built had all the appearance, at dusk, of a lunar landscape. But the sound of water steadily streaming in from the

Digging the channel with a walking dragline

chalk and the constant purr of pumps confirmed the earthly environment. For several months it was necessary to run a number of large pumps day and night to keep the working area in each hole free from flooding.

In stable soils such as chalk, water was led up to each pump by a single suction pipe drawing from a convenient low place in each hole. In the waterlogged sands of the upper reaches this method could have led to dangerous earth and water pressures upon the steel sheet piling supporting the sides of each large excavation. Here use was made of pumping from well points; perforated tubes sunk in a ring surrounding each hole and deep enough to draw the water level in the ground down to a position below the base of the hole. This enabled work to proceed on a firm, dry foundation.

In the sandy upper reaches adjoing Eriswell the channel passed through ground well supplied with subterranean water from the higher areas to the east. Any hole dug tended to collapse if the water was pumped out of it, and soft wet peat on the surface added to the problem of cutting the channel and keeping it stable. This difficulty was solved by cutting the channel only approximately to size so that the ground could drain and stabilize before the channel was finally shaped. Heavy inflows of water through the sides of the channel were blanketed by carefully-designed filters of fine pebbles laid against the channel side and kept in place by a layer of larger pebbles. Thus soil could not be washed through the fine pebbles by the streaming water, nor could the fine pebbles be washed through the larger ones.

Mechanical muscle and human skill

In years past the excavation of canals was done by large gangs of up to 1,000 men called 'navigators', a name soon contracted to 'navvies'; but the invention of the steam navvy, forerunner of the modern diesel-powered excavator, reduced the number of unskilled men on this type of work to the minimum force needed to assist skilled tradesmen. This part of the Flood

Protection Scheme illustrated this well. While only six large excavators cut and dumped, with monotonous regularity but consummate ease, the seven million cubic yards which had to be moved to form the channel, a small force of about 150 unskilled men aided some 50 skilled men in building the 48 major and 50 minor structures.

Skill of a different kind was shown in the transactions in land between owners and the Great Ouse River Board. Each transaction required a detailed agreement about the preservation or replacement of accesses, fences, water supplies and other assets. It is a great tribute to those concerned in the negotiations that all land needed was sold to the Board by agreement and this despite the great speed at which land had to be released to the contractor if work was not to be delayed.

There can be no doubt that this £3 million channel together with the relief channel will stand as a landmark in the history of Man's efforts to control the water needs of his land, and as a tribute to the vision, determination, energy, and goodwill of the many people concerned with its realization.

K. C. Noble, B.Sc.(Eng.), A.M.I.C.E., A.M.I.A.E., is a Civil Engineer on the headquarters staff of the Ministry's Land Drainage Division. He served in the Royal Engineers during the war, and then studied at London University before joining the Ministry in 1950. After a spell as Assistant Regional Engineer in Yorkshire, Mr. Noble moved to Norfolk to help in the restoration of the sea defences in Suffolk and Norfolk, damaged by the 1953 North Sea surge. In 1954 he was posted to headquarters in London, and has since been engaged on general duties, particularly in connection with the Great Ouse Flood Protection Scheme.

Now that considerations of site suitability are more important than nearness to a market, the Newent area of Gloucestershire is emerging as one with considerable horticultural potential

Lifting leeks grown by the L.S.A. at Newent

Newent and the L.S.A.

A developing horticultural area

W. J. Wright

THE NEWENT area, which extends to about 20 sq. miles, is shaped like an inverted triangle, with its base roughly along the line Dymock—Bromsberrow and its apex at Huntley. The A.L.S. Research Group in its Survey of Potential Horticultural Areas in the South-West, carried out by Dr. J. O'Connor, reported favourably and in considerable detail on the area. The bulk of the soils are sandy loams and, given suitable treatment, are ideal for intensive vegetable growing or the culture of top and soft fruit crops. The area is crossed by a number of valleys, particularly that of the River Leadon, and parts of the area rise to more than 300 feet above sea level so that, except for a few situations, the risk from spring frosts is not severe.

Compared with say Devon or Cornwall, Gloucestershire is not an early county, but the 6 deg. C difference in average temperature in January between Cheltenham and Penzance steadily reduces as the year advances; by early summer the mean figures are higher at Cheltenham. Although on average there are about four hours bright sunshine a day over much of the county, the Newent area is not so well favoured as Worthing or Penzance, and thus the production of very early tomatoes is not attempted.

The average rainfall is around 28–30 inches, and for shallow rooted crops grown to a soil moisture deficit of one inch the average irrigation need is at least 4 inches. Ample supplies of water are available from local stations.

Newent has a great reputation for cider and perry, dating back to before the Norman Conquest. The trees are mainly in mixed farm orchards but have not contributed markedly to farm incomes since the war. The demand for mixed fruit by the factories at Much Marcle and Hereford has fallen off sharply in favour of fruit from trees of true cider varieties. At one time Newent had the largest acreage of perry pears in the country, but now there are less than 1,000 acres. With no recent plantings to carry on the tradition, the acreage will decline still further.

Plums continue to be an important crop; hundreds of tons of a local culinary variety, Blaisdon Red, leave the southern part of the Newent area in most seasons.

L.S.A. move in

Vegetables for home consumption were being grown on enclosed common land at Gorsley, west of Newent, in the middle of the last century, but since there was no nearby market, few were grown on a commercial scale around Newent itself until just before the first world war. The real turning point came in 1935, when the Land Settlement Association obtained some 400 acres of land on the north side of Newent to establish an estate. Time has proved the wisdom of the choice of a south-facing slope on freely draining sandy loam, often of considerable depth.

This estate was one of eighteen established by the L.S.A. in various parts of the country between 1935 and 1939 as an experiment to see whether, and on what lines, industrial unemployed could be settled on the land on smallholdings. In the case of the Newent Estate the tenants came mainly from the north-east.

The recruitment of unemployed families ended with the outbreak of the second world war, and after the war the holdings were designated under the Agriculture Act 1947 as statutory smallholdings. Thus future applicants were required to have a minimum of five years' full-time agricultural or horticultural experience. However, the unique system of contractual co-operation that has always been a feature of the L.S.A. scheme was continued. Under this scheme a variety of services is provided for the smallholding tenants and the tenants are required, as part of their contract of tenancy, to use them. They include cultivation services from pool machinery on each estate, bulk purchase of farming requisites, propagation of plants and the marketing of all produce.

Development at Newent since the war has been truly remarkable, particularly considering that two-thirds of the holdings used almost exclusively for intensive horticulture are only about 3 acres in size and the average of

all the holdings is no more than 5 acres. A good deal of credit for this success must go to Arthur Piper, who was transferred from another estate to be manager there in 1947 and remained until his retirement in 1963. He saw the potential of the land, set about building up organic matter by buying local farmyard manure, and began developing markets for the steadily increasing volume of produce. In those earlier days tenants grew a wide range of crops, including early potatoes, lettuce, runner beans, cabbage and tomatoes. All were carefully packed and began to set a new standard for presentation on the South Wales markets.

Under glass

Since then, to meet increasing costs, the Estate cropping has gradually changed to focus on the high output crops. Individual tenants, relieved of marketing worries, can specialize in the production of fewer crops. Thus, on many holdings the outdoor crops are restricted to self-blanching celery, glass-raised and transplanted lettuce and runner beans all capable of producing a net output of over £500 per acre. To the original 1,750 sq. ft of heated landlord's glass, tenants have added an average of around 10,000 sq. ft of Dutch light (static or mobile) structures, often heated by warm air stoves. These are producing up to £160 per 1,000 sq. ft from a rotation comprising chrysanthemums, lettuce and tomatoes.

The greater part of most tenants' income is derived from glasshouse crops; fewer and fewer are keeping livestock. In spite of the slope of the land, mobile glasshouses are popular. A favourite rotation covers five crops. Lettuce is planted under the house in January and uncovered in late February. This is then planted up with a second lettuce crop which is matured without moving the house. A fortnight to three weeks before lettuce cutting is due to be completed, tomato plants from the central propagating unit (supplying over 250,000 tomato plants to tenants each season) are planted into bituminized cardboard pots. These are stood 'pot thick' in the heated glasshouse in a compost prepared *in situ* from the loam in the house. Subsequently the tomatoes are moved into the mobile (or static Dutch light structure) to give an earlier tomato crop than would otherwise be possible.

Planting out early summer cauliflower

A winter lettuce crop growing under a Dutch light structure

The other two sites are planted up with October and December flowering chrysanthemums. These succeed only if the first severe frost is delayed until the end of October.

Outdoors

Similar intensive methods are applied to outside crops. Economic pressure has forced tenants to forego rotation—so far without serious consequences, so long as organic matter is returned to the soil and crops are protected against pests and diseases.

The acreage of early potatoes has fallen abruptly in recent years. Although first diggings were competitive with early areas elsewhere, other crops, such as self-blanching celery and early summer lettuce, have been found more profitable. For the same reason early summer cabbage and cauliflower are not grown as much as formerly.

The Association itself farms 65 acres, not used for holdings, and produces vegetables to even out the supply to the markets, plus black currants and other soft fruit. Strawberries, mainly Cambridge Favourite, are grown as a two-year crop, with good yield in the maiden year if the runners are planted in August or early September.

Cropping on the L.S.A. Estate has been given in some detail because this sets the pattern for cropping on similar holdings in the area, a number of which have been started by ex-tenants. Fewer tenants now are finding it possible to obtain holdings of their own compared with the immediate post-war period, and new tenants are also having to find rather more than the £500 originally required as their equity in the holding. Because more glass is being erected as tenants' fixtures, the initial capital needed to enter a holding is often nearer £3,000 than £2,000, of which the tenant is required to provide a minimum of a quarter. The balance can then be borrowed on a medium-term Government loan.

Fruit north of Newent

Developments in vegetable growing here have been matched by progress in fruit growing in the surrounding area, especially north of Newent. A

considerable area of apples has been planted since the war, mainly Cox and Worcester on M 11. The majority of the 500-odd acres of black currants in the county are also grown in the vicinity of Newent, often on farms: some of the first contracts for fruit for black currant juice production were awarded to local growers by a firm which moved its factory to Coleford in 1947. Some very high yields have been obtained from the two commonest varieties, Baldwin and Wellington, the latter doing especially well in recent years. One or two growers in the area specialize in strawberry growing, and some are interested in annual cropping. On the other hand, one grower averages 10 tons of fruit per acre from established plants and sees no need for change. Peas for vining and French beans for processing on the spot have also been grown on farms around Dymock.

The Newent area has been slow to develop horticulturally only because of the distance from markets. But now that transport is no longer a problem, the early soils and favoured situation mark it out as one with a bright future.

W. J. Wright, B.Sc. (Hort.), N.D.H. (Hons.), son of a Leicestershire farmer, graduated at Nottingham University and joined the staff of the Ministry's Luddington Experimental Horticulture Station, Stratford-on-Avon, in 1952. He moved to Gloucestershire in 1955 as Horticultural Officer for the Newent district, and remained there until 1964, when he was transferred to N.A.A.S. Headquarters in London to become Horticultural Management Officer.

In the article **Triple Suckling Pays** (*T. J. Price, January, 1965*), Lt. Col. Harding-Rolls wishes it to be known that the initiation and development of the triple suckling system at the Hendre Home Farm was largely due to the efforts of his Farm Manager, Mr. J. R. Price.

The search for more efficient herbicides

by the Pea Growing Research Organisation,

as told by J. M. KING

Weeds in Peas

WEED control in the pea crop has made considerable strides in the past fifteen years. Before the introduction of suitable herbicides peas were a notoriously 'dirty' and difficult crop to handle; today they may almost be classed as a cleaning crop in the rotation.

The major break-through came in 1950, when dinoseb-ammonium was introduced for post-emergence use. It proved to be effective on threshed peas, which were the most commonly grown type of pea at that time, but it was less satisfactory on the more tender vining pea varieties. The development of the amine salt of dinoseb some years later overcame this problem, since it was found to be less phytotoxic than the ammonium salt, and today it is the main herbicide used on vining varieties. Dinoseb-ammonium is therefore only used on the more resistant threshed peas where its slightly better weed control can be used to advantage. MCPB also can be used post-emergence on certain varieties of peas, but it has rather a limited weed range. It is useful where creeping thistle or fat hen are a problem, but because of its limitations it has never been widely used.

These three materials not only provided better weed control than was previously possible, but they enabled changes in plant arrangements to take place. Research showed that higher yields were possible in narrow rows and once farmers were no longer tied by the need for inter-row cultivations, row widths were progessively reduced; this combination of chemical weed control and more efficient plant arrangement has done much to increase yields.

What then are the problems?

It would seem at first sight that weed control is adequately covered in peas and certainly the two dinoseb salts are effective herbicides. But they do have certain disadvantages, perhaps the most important being their high mammalian toxicity which necessitates the user wearing full protective

clothing. They are also influenced by weather conditions at spraying; the minimum temperatures for the application of the amine and ammonium salts of dinoseb are 45°F and 55°F respectively, and neither material should be applied when the foliage is wet. The stage of weed growth is important and, although both salts control a wide range of annual weeds as seedlings, certain species become resistant once this stage is passed.

THE AUTHOR

J. M. King, B.Sc. (Agric.), M.Sc., joined the Pea Growing Research Organisation in 1960, after completing his studies at Leeds University. He is now Senior Technical Officer of the Organisation and is primarily responsible for research on weed control in peas and beans.

Three troublesome weeds in peas which become resistant in this way are scentless mayweed, stinking mayweed and knotgrass. In early-sown crops it is often difficult to get suitable weather conditions and the right stage of weed development, with the result that weed control is unsatisfactory. The varying susceptibility of vining pea varieties to dinoseb can also present problems, and while the susceptible varieties can be sprayed with a reduced dose, this can also lead to less efficient weed control. The two main disadvantages of MCPB, its limited weed range and its effect on the crop, have already been mentioned.

What are the alternatives and do they offer advantages? These are mainly treatments with pre-emergence materials, the most widely used being mixtures of chlorpropham plus diuron or chlorpropham plus fenuron. These can be useful where weeds such as knotgrass and redshank predominate, but they are not recommended for use on very light, sandy or silt soils deficient in clay or organic matter. This restricts their use and there is a risk of crop injury when heavy rain follows application. Other materials which can be used pre-emergence are dinoseb in oil and dinoseb-amine, but these are used on only a limited scale and neither possesses long residual action. Dinoseb in oil is a more active herbicide than dinoseb-amine and consequently the rate required, and the cost of the application, are lower. Contact pre-emergence treatments, which rely upon the weeds emerging before the crop, can seldom be employed in peas. Since both weeds and

crop tend to emerge at the same time, the promotion of weed growth must be encouraged by cultivation well in advance of sowing, which in turn leads to an increased risk of seedbed deterioration.

Research and new materials

The alternatives to the post-emergence treatments cannot therefore be considered to be completely satisfactory replacements. A lot of research has already been done on this problem, and since 1958 the Pea Growing Research Organisation has tested almost fifty pre- and post-emergence herbicides in trials carried out on many different soils.

In recent years the introduction of a logarithmic sprayer for field screening of new materials has facilitated the testing of wider dose ranges than would have been possible hitherto, thus speeding up the initial investigations. Promising materials are further tested in replicated yield trials carried out in commercial crops.

In all this work particular emphasis is placed on testing the pre-emergence materials on different soils, as their efficiency can be affected by the amount of clay or organic matter present. This feature is at present one of the greatest obstacles to the development of a reliable and safe pre-emergence herbicide for general use on all soils. In spite of this drawback, however, they do offer certain advantages over post-emergence contact sprays.

They are applied before crop emergence and thus eliminate early weed competition at a time when the plant is drawing upon its reserves to establish itself. The effect of weather conditions at the time of application is far less critical than with post-emergence sprays, and the stage of weed development is not a factor which need be considered. This type of application avoids taking a tractor and spraying equipment through the growing crop, although of course the effect of wheelings caused by travelling over wet land can be almost as severe. Should bad weather prevent the spray being applied before crop emergence, a post-emergence treatment can still be applied at a later date. An important factor is the safety of these materials, and generally speaking they do tend to have lower mammalian toxicity than dinoseb.

In P.G.R.O. trials two substituted ureas, neburon and chloroxuron, were found to be particularly effective on the medium and light soils. Applied pre-emergence, both gave excellent control of most annual weeds on these soils, but control was not as good on heavy clay or peat soils. It is unfortunate that the cost of these herbicides has prevented them being marketed for peas, as they would otherwise have given safe and reliable weed control on the soils where chlorpropham mixtures cannot be used with safety.

Another material which proved suitable for use on a restricted range of soils was chloramben ('amiben'). This gave useful results on organic peat soils, but it was unreliable on mineral soils. However, the cost did not warrant development for the limited acreage of peas which are grown on peat soils.

Probably the most promising pre-emergence herbicide which is still under test is prometryne. This has been in P.G.R.O. trials since 1961 and weed control has been most impressive; even on heavy clay soils it has seldom been less than 80 per cent effective. It controls a wide range of annual weeds, including scentless mayweed, knotgrass, and annual nettle, weeds which are difficult to control with dinoseb-amine. It has also given useful control of

annual grasses. On the lighter soils there has sometimes been a temporary effect on the crop in the early stages, and although this is soon outgrown it may be that it will not be suitable for these conditions. No recommendations can be made for the use of prometryne in peas at the moment, but it will be studied in more extensive field trials this season.

The search for a new post-emergence treatment has not been neglected, and in trials dinoseb-acetate has shown certain advantages over dinoseb-amine. Its effect on the crop is less severe, but it is more expensive and, because it is less active, a higher dose is required. Unfortunately the mammalian toxicity is only slightly lower than for dinoseb-amine. It may prove useful for the more tender vining pea varieties, but it seems unlikely that it will replace dinoseb-amine to any great extent.

Wild oats

Where wild oats appear in pea crops they are one of the most damaging of weeds, pulling down yields considerably if uncontrolled. Extensive research on this important subject has been carried out by the P.G.R.O. for some years, with marked success, and there are now materials available to cover most conditions.

As a result of these investigations a booklet *The Control of Wild Oats in Peas* has been published by the P.G.R.O. It contains information on the choice of materials, instructions for their use, and the subsequent use of dinoseb-amine for broad-leaf weed control.

The Size of Sheep

Gerald Wiener

SHEEP come in a great many different shapes and sizes—and in quite a number of different wrappings too (as anyone in the wool trade will confirm). Body size in sheep, although easily measured, is not a simple character. Indeed the various factors influencing size interact in such a way that sometimes it may be necessary to choose some of the smaller lambs in a flock in order to achieve the end of bigger body size in future years. This article deals with this apparent contradiction. First we shall look at some of the factors influencing size and then discuss how to use the information.

Breed differences

Breed of sheep has an important part to play in determining body size, but so has the environment—whether hill, grassland, or arable—and the management to which the animals are subjected. Great Britain supports upward of forty breeds of sheep, and many of the crosses between them have found a niche in the economy of sheep production. It is obvious that there are big differences between many of these breeds in appearance and in size, but the differences are not as great, nor the breed characteristics as fixed, as might be supposed. As a rule different breeds are kept in different environments and under different systems of management, so that direct comparisons are difficult.

For example, the two British breeds which would generally be said to differ most in size are the Lincoln Longwool and the Welsh Mountain. Judged by their weight in their native haunts, one breed weighs about three times as much as the other. When both are kept and managed as one flock—as on one of the farms of the Animal Breeding Research Organisation for a number of years—the Lincoln was no more than twice the weight of the Welsh. On the other hand, Scottish Blackface ewes kept on two separate

The contrast between this Lincoln Longwool and the Welsh Mountain sheep shown opposite is a good illustration of the way in which many British breeds of sheep vary markedly in appearance and size

farms only fifteen miles apart differed greatly in weight (90 lb *v.* 140 lb) and the flock with the heavier ewes produced twice as many lambs as the other.

Thus, to discover what part of the differences between animals will be passed on to their offspring, environmental differences must be allowed for.

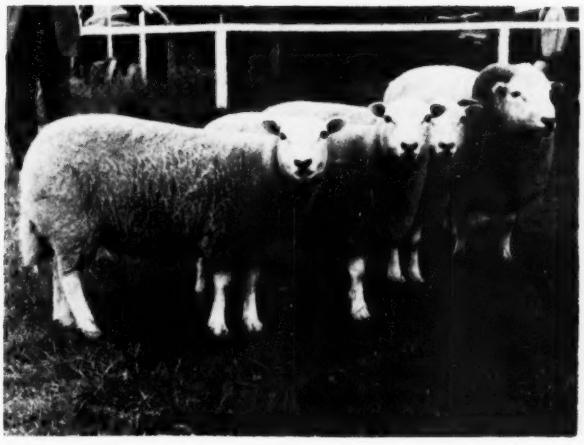
Maternal influences

Among the environmental factors are non-genetic maternal influences as shown by the Lincoln and Welsh breeds run together in the single flock. Crosses were made both ways between these two breeds, i.e., Lincoln-Welsh crosses were born to Lincoln ewes mated with Welsh rams and to Welsh ewes mated with Lincoln rams. At birth, the crossbred lambs from the two groups of ewe, although genetically the same, differed on average by 2–2½ lb, or between 20 and 25 per cent of the average birth weight; at weaning the difference had increased to around 6–8 lb, but in terms of the average weight at weaning this was only about 10 per cent. By about a year old, no difference in weight was discernible between the crossbreds from the Lincoln and from the Welsh mothers—although in some other aspects, e.g., fleece weight, the maternal effects were still clearly recognizable.

Another factor of this nature arises from the difference between twins and singles. Differences due to the age of mothers are also familiar. The offspring of ewe lambs or of gimmers, for example, are usually at a disadvantage in weight to the offspring of older ewes. Transient but often substantial differences have also been ascribed to the time of year, even the day, when lambs are born; after all, one group of lambs may be born in a snowstorm and another group on a sunny day, or some may be born at a time to reap the greatest benefits of new growth of grass. This type of difference is unpredictable from year to year.

Finally, of course, there are size differences between the sexes, not always obvious at birth but certainly of consequence from weaning onwards.

On account of these various external factors an animal may be small because it has been unlucky yet have within it the genetic potential for good growth and large size. In other words, a large part of the observable differences in size among sheep is not heritable and is not therefore reflected in the offspring.



These Welsh Mountain sheep are looking sleek and well-fed, as befits animals prepared specially for the 1964 Royal Welsh Show

'Correction'

Allowance can be made for some of the non-inherited differences between sheep, provided records have been kept. For the best results the correction factors should be worked out for each particular flock and circumstance. An example of a set of factors appeared in a recent publication of the Ministry of Agriculture*. The factors were calculated from the records of a crossbred flock on a grassland farm in which ewe lambs were bred from and twins were run with singles. The factors for 'correcting' weaning weight were:

FACTORS FOR SEX AND TWINNING		FACTORS FOR AGE OF DAM
Male single	add 0 lb to weight of lamb	1 year-old dam add 11 lb to weight of lamb
Female single	add 7 lb ,, ,, ,, ,,	2 year-old dam add 0 lb ,, ,, ,, ,,
Male twin	add 14 lb ,, ,, ,, ,,	Dam 3 years old and over *deduct* 4 lb from weight of lamb
Female twin	add 20 lb ,, ,, ,, ,,	

Other flocks in other years may yield different correction factors; nevertheless, the figures quoted above can be regarded as a guide to the order of magnitude of the effect of sex, twinning and age of ewe.

The consequence of 'correction' with the above figures is to bring weaning weight to the base of single male lambs born to two-year-old mothers (gimmers). For example, the weaning weight of a female twin reared by a one-year-old mother (hogg) would have 20 + 11 lb added to her weight which, if 50 lb, would be 'corrected' to 81 lb. On the other hand, a single ram lamb born to an old ewe would have 4 lb deducted from his weaning weight, and if this were 80 lb the 'corrected' weight would be 76 lb. If it were known that the female twin had been born at a less favourable time of the lambing period than the male single, some further credit could be given to the female twin. Thus it becomes apparent that the female twin is potentially the better grower than the male single and, incidentally, the hogg potentially the better mother (assuming that she reared both her twins about equally well) than the old ewe. The uncorrected weaning weights of these two animals would not have led to the same conclusion. If a choice is to be made simply between female lambs for flock replacements, then of course the sex correction would be unnecessary.

*Bulletin 166, *Sheep Breeding and Management* (3rd edn.), 1964

No easy method of 'correction' is possible for the subtler mothering qualities which influence growth in the normal flock where all ewes are of the same breed or cross. The two-breed situation discussed earlier served merely to illustrate the importance of these effects.

Selection

Unfortunately, even when live weights have been corrected for some of the environmental advantages and disadvantages for which the lambs themselves are not responsible, the differences which remain are still not very strongly inherited—perhaps not more than 10 per cent of the differences in birth weight or 20 per cent of those in weaning weight. This suggests, for instance, that two groups of ewes which have themselves differed by 10 lb in 'corrected' weaning weight would, when mated to the same ram, have offspring differing by not more than 1 lb in their 'corrected' weaning weight. This may indeed seem small progress, but cumulatively it could still be useful. To this must be added the advantage of the heavier ewes in producing slightly heavier fleeces and the mild tendency for them to have more twins (or, alas, to be barren!) than lighter ewes.

A point of interest, especially in culling, is the fact that genetic selection for size is more successful among older animals than among lambs. Older sheep have had more opportunity to express their genetic potential and a bigger proportion of the differences observed at that stage is passed to their offspring—although the advantage to the offspring may not in turn be obvious by weaning.

Live weight at a particular age (e.g., weaning) is not necessarily a good way of describing growth, and in a ewe flock containing different breeds this approach to selection would be futile unless done separately within each breed, since two animals of the same live weight might in fact have an entirely different body form and body composition—something which, to a lesser extent, will be true even within a breed.

Selection of the 'potentially' heaviest ewes for breeding and the 'potentially' heaviest ewe lambs as replacements would be only one aspect of selection for body size. The largest part of any progress should come from the use of rams which have been shown to be well above the average of their own contemporaries on a combination of their own size, that of their closest relatives, and preferably that of their progeny in a previous year. Of course, making allowances for differences in environment and management applies forcibly in the choice of rams.

Genetic considerations are in practice rarely the only ones—one reason, incidentally, why genetic progress is often so slow! A lamb with a good 'corrected' weaning weight may still be thought to be too small to survive successfully and become a good mother, especially if bred from as a hogg. There is no doubt that a ewe can pass on to her offspring, in the short term, some of the effects of environment. (For example, in some circumstances groups of hill ewes given supplementary feeding during late pregnancy produced more and bigger lambs than genetically similar groups which had to make do on what the hill produced.) Long-term genetic considerations, which call for single-mindedness, might occasionally conflict with short-term economic ones. The final choice will depend on priorities.

Crossbreeding

Notwithstanding the fact that breed differences are not always as great as they appear to be, the quickest way of genetically influencing body size and growth rate of sheep is by crossbreeding, because, by and large, the offspring are intermediate in size between the parental breeds. In the example of the Lincoln-Welsh cross mentioned earlier, despite the considerable maternal effects, the crossbred offspring born to the Welsh ewes were larger even at birth than pure Welsh lambs, and those born to the Lincoln ewes were smaller than the pure Lincoln lambs. Occasionally, crossbred offspring may be slightly better than the *average* of the two parental breeds and in exceptional cases better than the better of the two parent breeds.

This phenomenon of 'hybrid vigour' could, if it occurred, be looked upon as an additional bonus, but it would not normally be the reason for crossbreeding if live weight and growth rate were the characters to be changed. Intermediacy in the characteristics of the parents would be the major objective. It is in fact on this basis that much of the British sheep industry is organized.

Objectives

Too many objectives are a barrier to genetic improvement. If improvement in live weight or growth rate is desired it can be readily achieved if given first priority and pursued single-mindedly. Flock management, cross-breeding and selection can all be used to change body size of sheep. Genetic improvement by selection means the exploitation of the best animals, and these can be found only by recording the facts and making allowance for non-inherited differences. A programme of crossbreeding will usually go hand in hand with some selection as well—at least on the female side. The same principles apply to genetic improvement of any economic character of sheep. Only the details of approach and the rates of progress may differ.

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Vase-fresh Flowers

W. Hugh Smith

EFFORTS are being made to sell more cut flowers. To this end there will have to be more and better publicity, development of new methods of presentation and discovery of fresh retail outlets. There is also a fundamental need to ensure that the people who buy cut flowers can obtain a reasonable length of life from them.

Florists generally know how to handle and prepare blooms for sale, but surprisingly little critical investigation has been carried out into the factors that influence the potential life of the flower as it leaves the wholesale market. Until recently virtually no research had been done in the United Kingdom. This is now being remedied, and research on the handling, transport and storage of flowers is being pursued at the Ditton Laboratory.

The objectives of this research are centred mainly on the five commercially most important—narcissus, tulip, carnation, rose and chrysanthemum. Each presents its own special problems within the field of post-harvest physiology.

At the grower's end

More exact knowledge is needed about the effects of withholding water before packing ('dry-packing') as against giving the flowers a preliminary 'drink'; also about the effects of pre-cooling. Nowadays dry-packing of carnations is claiming a lot of interest. Non-turgid blooms can be packed with a saving of space and are less liable to damage than turgid blooms. It is also said that they have a longer life than blooms packed after standing in water. But experimental evidence on this point is still lacking. A disadvantage is the need to revive the flowers at their destination by standing them in water for some time before sale. It is said that retailers don't like this when dealing with home-grown carnations.

The practice of extracting field heat before packing could be extended with benefit during the warmer months of the year, and indeed growers who have cold stores often make use of them during the period between cutting and packing. It is, for instance, a standard practice of the leading growers of glasshouse roses to stand the rosebuds in a cold room at about 45°F for a few hours immediately after cutting.

Daffodils grown in the Isles of Scilly are a special case. Here, owing to high winds, the flowers have to be cut in the breaking-bud stage and opened indoors. Control of the conditions under which these flowers open has, however, been rather haphazard; better results could probably be achieved in temperature-controlled rooms.

Efforts are now being made to encourage the marketing of narcissus in the breaking-bud stage. If this practice can be extended it would provide a safeguard against the sale of partly-spent flowers.

Cold storage not a complete answer

The relation between potential life and the best possible storage temperature of flowers has been determined over an extensive range by workers in the United States. The published information serves as a useful guide, provided it is remembered that direct applications of procedures suitable for produce grown under American conditions is not always valid for this country. Further experimentation with native-grown produce is always advisable and is in fact now being carried out.

The abuse of refrigerated storage of flowers has sometimes aroused a certain bitterness among those at the end of the chain of distribution. This may have been due to the failure of the grower to realize that cold storage does not halt deterioration, but merely slows it down. At low temperatures the progress of deterioration can be so deceptively slow as to tempt the grower to store too long, in the belief that virtually no change has occurred. Nevertheless, when the flowers are subsequently removed to ordinary room temperature their remaining life is very short and they quickly wilt. The storage period must therefore be adjusted to allow a reasonable post-storage life.

Getting to market

The past few years have seen something of a revolution in flower packing. There has been an almost universal switch from the returnable wooden box to the non-returnable cardboard box. The relatively poor ventilation of the cardboard box and the possible effects of the chemical constituents used in the manufacture of the board have created a certain amount of anxiety among growers. In point of fact, however, the absence of any evidence of accelerated deterioration suggests that under ordinary conditions of transport and handling the cardboard pack is not noticeably inferior to the wooden, provided it is of sound construction and made of a sufficiently strong board.

Investigating this, a survey team from the Ditton Laboratory has mapped the change and distribution of temperature in cargoes of daffodils shipped in cardboard packs in the hold of the R.M.S. *Scillonian* and subsequently on rail to London. They have found that when stacked in large bulk the consequent restricted air circulation could result in a temperature rise of the flowers.

This was due to their metabolic heat production. It was shown too that ethylene produced by the flowers could reach a concentration of 0·06 p.p.m., which could reduce their vase life if it persisted long enough. Another hazard may arise if rotting from *Botrytis* infection occurs in any part of a consignment, since it may result in a surge of ethylene production.

Gas packs

The so-called 'gas pack' is an attempt to combine the advantages of controlled atmosphere storage with a novel type of package. In essence it consists of a tapered plastic tube in which the flowers are placed and which is then inflated with air to a sufficient pressure to make it firm. The end of the tube is then heat-sealed and it will keep firm for some days. It is in fact an ideal package for retail handling through supermarkets.

Were the tube filled with plastic flowers, there would be no problem other than attracting enough customers. But when delicate living tissues are sealed in the tubes there are complications. Oxygen is used up faster than it can pass into the pack through the relatively impermeable film and the concentration falls. Carbon dioxide is released from the flowers faster than it can escape and the concentration builds up to an equilibrium maximum. Normally this will be slightly beneficial; but since the carbon dioxide escapes faster than the oxygen can enter, the pack slowly deflates. Deflation is faster at higher temperatures. If temperature is too high and the period of enclosure too long, there is also a danger that the oxygen supply can fall below a level at which healthy life of the flowers can be supported.

Another hazard occurs when slight changes of temperature cause condensation of moisture from the saturated atmosphere on to the inside of the film. Under these wet conditions flowers with fungal infection are liable to deteriorate. They can produce a higher-than-normal ethylene concentration, which in turn can reduce subsequent vase life of uninfected flowers in the pack.

Strict control of the quality of flowers packed, of temperature during marketing and of the length of time spent inside the pack are essentials to success. Admittedly, this is not easy in any system of distribution that cannot be carefully watched. But it is said to have been achieved in Swiss, German and French supermarkets, where they have a type of organization rather different from that in the United Kingdom.

Growth and keeping quality

That the conditions of growth can affect the keeping quality of flowers is almost self-evident. Exact information on this aspect of cut flower handling is scanty and comes from American sources. But it is possible to make some tentative generalizations. High light intensity, coupled with favourable temperature, is likely to lead to high dry matter content and good keeping quality. Excessive outdoor temperatures can, however, lead to a poorer keeping quality. We don't yet know whether flowers grown in glasshouses in which the atmospheric carbon dioxide is enriched have any advantage in keeping quality.

Extremely low or excessive moisture levels in the soil are not conducive to keeping quality. Conditions of moisture stress are associated with inferior quality. These may arise from excessive dryness of the air, as well as from lack of moisture supply.

Disease control in the glasshouse is undoubtedly very important. The presence of infection reduces the expected life of the flowers themselves and may reduce that of uninfected flowers through the influence of the ethylene produced.

Within the normal range, the level of the usual nutrients does not appear to be too important.

W. Hugh Smith, B.A., Dip. Hort. (Cantab.), is a Principal Scientific Officer at the Ditton Laboratory of the Agricultural Research Council. After leaving Cambridge University he worked at the D.S.I.R. Low Temperature Research Station, Cambridge, until 1930. He then spent 5 years on the staff of the Ontario Agricultural College in Canada before returning to the Ditton Laboratory in 1935 to work mainly on the transport and storage of fruits and vegetables. Since 1963 Mr. Smith has been investigating the storage and transport of cut flowers with equipment designed at Ditton.

Agricultural Chemicals Approval Scheme

Since the publication of the 1965 List, the following products have been approved:

INSECTICIDES

DIAZINON

Granular Formulations

For the control of carrot fly.

Basudin 5 G—Fisons Pest Control Ltd.

Wettable Powders

For the control of cabbage root fly.

Basudin 40 W—Fisons Pest Control Ltd.

DIMETHOATE

Liquid Formulations

Rogor E—Fisons Pest Control Ltd.

FUNGICIDES

CAPTAN

Wettable Powders

Captan Fifty M and B—May and Baker Ltd.

DITHIANON

For the control of apple and pear scab.

Colloidal and Wettable Formulations

Delan—Plant Protection Ltd.
Delancol (formulated as a liquid suspension)—Plant Protection Ltd.

MANEB

Wettable Powders

Mi-Dox Maneb—Midox Ltd.

ZINEB

Wettable Powders

Mi-Dox Special 70% Zineb—Midox Ltd.
Tritoftorol—F. Bos Ltd.

HERBICIDES

2, 4-D

Ester Formulations

Croptex D-Ester—Crop Protection (Grantham) Ltd.
Mirvale 2, 4-D Ester—Mirvale Chemical Co. Ltd.

DALAPON

Sodium Salt Formulations

Mi-Dox Dalapon—Midox Ltd.

DICHLORPROP with 2, 4-D

Amine Salt Formulations

Croptex Polygon Plus—Crop Protection (Grantham) Ltd.

DINOSEB

Amine Salt Formulations

Cleanacres DNBP (Amine)—Cleanacres Ltd.

PYRAZON

A soil acting weed-killer for use pre-emergence in sugar beet.

Wettable Powders

Pyramin—B.A.S.F. Chemicals Ltd., York House, Westminster Bridge Road, S.E.1.
Pyramin—Boots Pure Drug Co. Ltd.
Pyramin—Shell Chemical Co. Ltd.

2, 4, 5-T with 2, 4-D

Ester Formulations

Synchemicals Weed and Brushkiller—Synchemicals Ltd.

MISCELLANEOUS

METALDEHYDE

Dry Slug Baits

'Action' Brand Slug and Snail Bait Pellets—Agricultural Central Trading Ltd. 1, White Hill, Chesham, Bucks.
Dethmor Slug Bait—Gerhardt-Penick Ltd., Thornton Laboratories, Purley Way, Croydon.

27. Ormskirk, Lancashire

J. K. Thompson

THE traveller leaving the M.6 at Wrightington and going westward sees, from the top of the hill above the village of Parbold, a narrow plain spread out below him extending from the foot of this high land to the sea in the west, and from the Ribble Estuary in the north-west to Liverpool and St. Helens in the south-west. This plain is not completely agricultural, for factory chimneys can be seen here and there, indicative of other activities and a reminder of the close proximity of great industrial areas. Nor is it uniformly flat; little knolls stand out in places, and on one of them, almost in the centre of the plain, is the old market town of Ormskirk which gives its name to the area.

The Ormskirk district of Lancashire is one of the outstanding farming areas of this country—and deservedly so, for it is an area of high farming and high production, cultivated by progressive men with exceptional skill in crop husbandry although their farms are relatively small. It is not a district of great beauty, despite the big seaside resort of Southport and an interesting coastline; but to travel through it, particularly on a day in early summer, is to appreciate that it is 'fair indeed', abundant and well cared for.

The soils, the climate and the immense markets close at hand, favour the intensive arable husbandry typical of the district. The most important crop is the potato, but the range of arable production is wide and includes cereals, sugar beet and field vegetables of all kinds, for both marketing and processing. Glasshouse and horticultural holdings are also important, especially in the Hesketh Bank area adjacent to the Ribble Estuary north-east of Southport, and produce tomatoes, chrysanthemums, lettuce, celery and a variety of other crops.

With only a small acreage of grassland, livestock farming is very limited. Many farms have one-year leys for hay, which is sold; but although a number of cattle may be carried, there are few dairy herds. There are, however, some specialist pig holdings, and occasional flocks of sheep. On one exceptional farm on the Ribble Estuary, where there is salt marsh grazing, nearly 1,000 ewes are lambed each year. Poultry is still important and many farms keep a laying flock.

There are two main soil types, very different but both under the same system of husbandry: the Shirdley Hill Sands, which cover most of the area,

and the 'moss', or peat, soils. The former are mineral soils; black (the typical Ormskirk 'black sands') or brown in colour, light, easy working and usually well drained. They respond well to the high farming practised, and in the relatively mild climate with its 30–34 inches of rain distributed throughout the year, they give heavy crops—sometimes two in a season. But, as they are not inherently fertile, they must be well farmed; and in the unusual event of a drought, crops soon suffer.

The sands lie at an elevation of between 50–60 and 120–130 feet. Between them and the sea is a band of mossland, the second main soil type, at a much lower level, from 12–50 feet. In spite of the preponderance of the sandy soils, there is a considerable area of mossland and its agricultural value is high.

For many years the cultivation of the mosses was limited by extreme acidity and the need for drainage. During the last decade these difficulties have, in large measure, been overcome and the cropping is now as diverse as that of the sands, with double cropping occasionally practised. Because of their low elevation, drainage of these soils has been, and to some extent still is, a hazard. Following the flood disasters in the '50s, a big drainage scheme was installed over a large area behind and north-east of Southport, involving pumping instead of gravity outfalls to the sea. But further work is needed to deal with the outfall of the River Alt and so safeguard the southern mosslands. Unlike the mineral soils, the mosses are best under drier conditions. Late frosts make them later than the sands, where early potatoes can be grown and the early sowing of other crops is practicable. The potato is more dominant than on the sands, but the scourge of Potato Root Eelworm has reduced the acreage on all soils.

There are also scattered areas of wild moss, all potentially good agricultural land. Some are being worked for horticultural and industrial peat; others are being reclaimed for agriculture. It is possible to create productive land from them quite quickly, and this need not be costly, but, though diminishing, they may remain for some time to demonstrate the original state of all this area.

In addition to the main soil types, there is a very infertile, yellow sand on the coastal fringe below Southport, giving way to the big dunes alongside the shore. This is often heathy and is mostly indifferently farmed, but the Formby area is noted for its asparagus, which is grown even amongst the dunes. Lastly, alongside the Ribble Estuary is an area of silt land, reclaimed from salt marshes in the last hundred years or so. This is good land, growing the typical crops of the district but with rather more grassland and livestock husbandry associated with the salt marsh grazing outside the sea wall.

A characteristic of crop husbandry throughout the district is the very heavy application of fertilizers; farmyard manure is used on a number of farms, but it is mostly bought in from other parts of Lancashire and from Cheshire.

Large areas, with tenant farmers, are owned by the big estates, such as Knowsley (Lord Derby) and Croxteth (Lord Sefton); but there are also a fair number of owner-occupiers.

A very serious and disturbing feature is the constant and considerable encroachment of urban and industrial development on this extremely valuable agricultural land.

C. DOBSON
Agricultural Land Service, Reading

Farrowing Houses for Pig Weaner Groups

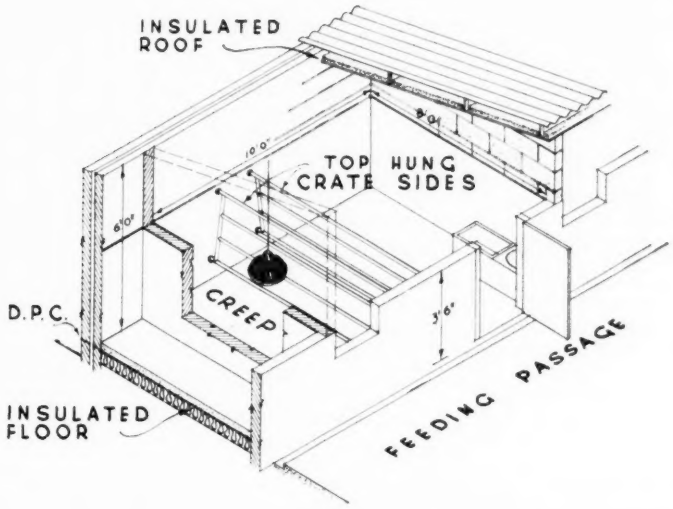
In Wales there are 16 pig weaner groups, with a total membership of about 1,100. The main object of the groups is to co-operate in the production of high-quality weaners for sale direct to specialist fatteners on a contract basis without passing through the normal auction markets. Each group formulates its own rules to ensure that the quality of the weaners sold does not fall below specified minimum standards. It is estimated that, on enrolment, each member has about six sows and this increases to ten sows after about two years.

Inevitably this increase in sow numbers has resulted in many members having to expand their farrowing accommodation. Much has been and can be achieved by adaptations of existing buildings, but in many cases it will be necessary to provide new buildings. The majority of members require general-purpose pens which can be used for housing their sows before, during and after farrowing, and which are also suitable to house the litters until sold. Mr. Harris, of Ffos-y-Ficar, Boncath, Pembrokeshire, has constructed a range of lean-to pens which meets these requirements.

These pens are built with 11 in. cavity brickwork, an insulated roof and hinged crate sides. The sides and sow feeding troughs are removable. Each sow is brought into her pen 10 to 14 days before farrowing. She is confined

to the crates a few days before farrowing and for one week afterwards, and is only let out to feed, drink and exercise for a short period each day. She is removed from the pen and transferred to other accommodation six weeks after farrowing, but the weaners are left behind in the same pen until 9 weeks old. Since the pens were first used in 1957, the raised litter average has been 10·1.

A development of this type of general-purpose pen is illustrated in the diagram below. The photograph in the heading shows a pen in use with one of the crate sides removed. The dimensions of 8 ft × 10 ft can be varied but the area should not be reduced below about 80 sq. ft. The minimum length of the crate side is determined by the length of the average sow, and this should not be less than 7 ft.



Pen divisions are best carried up to the underside of the roof because this is not only the cheapest way of supporting the purlins but it also helps to reduce draughts, restrict the spread of disease and keep individual pens warm when all the pens are not occupied. There are many ways of insulating the roof but it is important to ensure that an adequate vapour barrier is provided. With an asbestos cement roof, a popular method is to use 1 or 2 inches of glass wool, or asbestos wool, lined with a continuous sheet of polythene as a vapour barrier and $\frac{1}{8}$ in. fully compressed asbestos partition boarding. The height of the brick wall between the creep and the feeding passage can be as low as 18 in. to enable the pigman to step easily into the creep. Pen floors should also be insulated and fall about 3 in. towards the door. Fixings for water bowls must be extremely firm and the bowl itself embedded in concrete to prevent it being wrenched loose by the sow. Cement-rendered wall surfaces enable routine disinfecting to be carried out quickly and easily. Ventilation openings are best confined to the feeding passage roof and end walls. Hoppers in the outside pen wall should be avoided, as they usually create undesirable draughts in the crate and creep.

Where dry sows can be housed elsewhere and weaners are sold at nine weeks of age, then two pens would be required for every five sows.

Costs for this type of work vary, but the cost of materials only, including all fittings, for a lean-to range of four pens 43 ft × 12 ft would be about £350.

Annual Review, 1965

A Short Guide

THE results of the 1965 Annual Review and Determinations were published in a White Paper (Cmnd. 2621)* on 17th March, 1965.

DEVELOPMENTS IN AGRICULTURAL POLICY

The Government will be considering the place of agriculture in the national economic development plan which is being prepared but have reached conclusions on certain lines of agricultural development which they consider desirable. The 1965 Review has been conducted against this background. The Government consider that the principles of the 1947 and 1957 Acts provide a sound framework of agricultural policy. They believe that the primary objective of future policy must be to encourage the growth in productivity through the maintenance of stability in the industry, the introduction of new technological improvements, better farm management, improved marketing, and encouragement to farmers to obtain benefits of scale in production and marketing. These developments will lead to further releases of resources for use elsewhere in the nation's economy. In pursuit of these aims the Government have already strengthened the agricultural advisory services and are taking measures to secure better control of animal diseases by greater concentration on preventive medicine; at the Review the Government have announced decisions to introduce pilot schemes during 1965 to encourage farm business recording, extend the Small Farmer Schemes to include a further 40,000 farmers and to place greater emphasis on the improvement of farm business management, improve and increase the subsidies to hill farmers, improve credit facilities for agriculture and encourage the development of agricultural co-operative marketing.

The Government have also outlined in the White Paper further developments in agricultural policy which are being urgently considered. These include proposals for a further extension of agricultural co-operative and group activity; the development of upland areas; the structural improvement of agriculture; and the establishment of a Meat and Livestock Commission with responsibilities for the improvement of meat marketing.

DETERMINATION OF GUARANTEES

Agricultural net output increased substantially in 1964/65 and there were increases in the production of cereals, sugar beet, eggs, mutton and lamb and pigmeat. The downward trends in the dairy herd and in the number of beef breeding cattle have been checked. Agricultural net output for 1964/65 is forecast at 137 (average of 1954/55 to 1956/57 = 100) compared with 127 for 1963/64 and 125 for 1962/63.

Actual net income is estimated to have risen to £472 million in 1964/65 compared with a revised estimate of £409 million in 1963/64. Adjusted for normal weather conditions, the figure is £456½ million in 1964/65 compared with £425½ million in 1963/64.

The net cost increase on Review commodities is £29 million (the main item is a rise in agricultural wage rates) and the figure of £25 million has again been taken as an indication of the rise in farm incomes due to increasing efficiency.

Exchequer cost in 1963/64 was £294 million. In 1964/65 it is expected to fall to £270 million; the estimate for 1965/66, adjusted for the determinations at this Review, is £293 million.

Changes in guaranteed prices are shown in Table 3 (pp. 200 and 201).

MILK. The downward trend in the dairy herd has been arrested and there was an appreciable improvement in producers' returns in 1964/65. Nevertheless the number of milk producers continues to fall. The maintenance of the dairy herd is important not only for milk but also for beef and because of this, and the importance of milk in farm incomes, the Government have decided to increase the guaranteed price by 1*d.* per gallon.

FAT CATTLE. The downward trend in the beef breeding herd has been arrested but, because of the world shortage of beef, demand in 1964/65 has been exceptionally strong. In view of world market prospects, the Government consider that some encouragement should be given to a moderate expansion of home production of beef. The guaranteed price

*H.M. Stationery Office, price 3*s.* 6*d.* (by post 3*s.* 10*d.*)

has been increased by 4*s.* per live cwt, the scope of the calf subsidy widened and the rate increased by 10*s.*, and the hill cow subsidy increased by £1 per head. As from 29th March, 1965, the seasonal scales and scales of supplements and abatements under the fatstock guarantee arrangements will be adjusted (both for cattle and sheep) and the quality differential between Grade I and Grade II cattle will be discontinued.

FAT PIGS. Certifications of pigs rose steeply in 1964 65 and are expected to be considerably higher again in 1965 66. Market prices in 1964 65 remained fairly firm until the latter part of the year. To reflect the market situation the Government have decided to increase the level of the middle band to 12·0—12·8 and to reduce the guaranteed price by 1*s.* 7*d.* The immediate effect of these changes will be to increase producers' returns on average by 11*d.* per score. Adjustments have been made in the steps of the flexible guarantee which should lead to smoother working of the arrangements. Quality premiums have been reduced by 1*s.* per score and the separate stabilizing arrangements for bacon pigs and other pigs discontinued.

EGGS. There was a considerable increase in production in 1964 65 and the guaranteed price has been reduced by 1*d.* per dozen.

CEREALS. Production of wheat and barley combined exceeded the standard quantities by over a million tons—leading to a reduction in imports. Having regard to the trend of production, the obligations under the Agreements with overseas suppliers, and the cost of the Exchequer subsidy, the Government have reduced the guaranteed price of wheat by 1*s.* 1*d.* per cwt and barley by 1*s.* 4*d.* per cwt. But in view of the rising consumption of cereals, the standard quantities have been increased from 3·3 to 3·4 million tons for wheat and 6·5 to 6·75 million tons for barley. The target indicator price for wheat has been increased from 20*s.* to 20*s.* 6*d.* per cwt.

POTATOES. In order to maintain the United Kingdom crop acreage, the Government have raised the guaranteed price by 5*s.* per ton.

SUGAR BEET. To maintain production the guaranteed price has been increased by 2*s.* 6*d.* per ton.

PRODUCTION GRANTS. Changes in addition to those referred to above are: an annual flat rate hill sheep subsidy (18*s.* per ewe) to replace the existing variable subsidy which has been paid in some years but not others; the winter keep scheme in England, Wales and Northern Ireland to be replaced by supplements to the hill cow and hill sheep subsidies; reductions of £2 million in the fertilizers subsidy and £$\frac{3}{4}$ million in the lime subsidy.

Table I

Estimated gross output of agriculture in the United Kingdom[1]
Years beginning 1st June

	£ *million*	
	1963/64	1964/65 forecast
TOTAL FARM CROPS[2]	299	334
Wheat	71	87
Barley	103½	111½
Oats	8	7½
Potatoes	70½	73
Sugar beet	32	42½
Hops	8	8
Other	6	4½
TOTAL FRUIT, VEGETABLES AND FLOWERS	163½	176
Fruit	45	49½
Vegetables	87	93½
Flowers and nursery stock	31½	33
OTHER OUTPUT[5]	29½	34½
TOTAL LIVESTOCK AND LIVESTOCK PRODUCTS	1,172½	1,236½
Total Fatstock	538	569½
Cattle	267	279½
Calves	3½	3½
Sheep and lambs	83½	86½
Pigs	183½	200
Milk and milk products	372½	400½
Eggs[3]	169½	166
Poultry[4]	74½	81½
Wool	16	17
Other	2	2
CHANGE IN STOCKS[6]	+1½	+15½
TOTAL	1,666	1,797

[1]In Great Britain from holdings of over one acre only; in Northern Ireland one acre and over.
[2]Includes sales of crops for feed.
[3]For food and for hatching.
[4]For food and for stock.
[5]Includes deficiency payments for barley, oats and mixed corn not sold off farms.
[6]Value at market prices of changes in the volume of stocks and work in progress.

NOTE—Because of rounding, the sums of the constituent items do not always equal the totals shown.

Table 2

Estimated farming net income in the United Kingdom
Years beginning 1st June

	£ *million* 1963/64	1964/65 forecast		£ *million* 1963/64	1964/65 forecast
FARMING NET INCOME	409	472			
TOTAL EXPENDITURE	1,410	1,464	TOTAL REVENUE[5]	1,819	1,936
Labour	312½	314	Farm crops	300½	333½
Rent	128	141½	Fatstock	537½	569½
Machinery:			Milk and milk products	372½	400½
Depreciation[1]	81½	85	Eggs and poultry	244	247½
Fuel and oil	48	50½	Horticultural products	163½	176
Other	96½	100	Other products	48	54
Feedingstuffs[2]	402	425½	Production grants and		
Fertilizers	120	125½	other credits	112½	112
Seeds[3]	31½	27	Valuation change[6]	40½	43
Imported livestock[4]	80	83			
Other expenses	110	112			

[1]Estimated provision for machinery and vehicles, at replacement cost.
[2]Gross value of bought feed whether home-grown or imported.
[3]Imported seeds plus merchants' margins on home-grown seeds.
[4]Imported livestock plus transport and merchanting charges on inter-farm sales of home-bred livestock.
[5]Estimates in Table 1 are here adjusted for changes in stocks awaiting sale. Includes receipts from sales of crops for feed.
[6]Increase in value at cost of stocks and work in progress.

Guaranteed Prices

Table 3

LIVESTOCK AND LIVESTOCK PRODUCTS

Commodity	(i) Guaranteed Prices 1964/65 determined after the Annual Review, 1964	(ii) Price change compared with the 1964 Annual Review Guarantee	(iii) Guaranteed Prices 1965/66 determined after the Annual Review, 1965
Fat Cattle (per live cwt) (*a*)	170*s.* 0*d.*	+ 4*s.* 0*d.*	174*s.* 0*d.*
Fat Sheep and Lambs (per lb estimated dressed carcase weight)(*a*)	3*s.* 2*d.*	No change	3*s.* 2*d.*
Fat Pigs (per score deadweight) (*a*) (*b*)	46*s.* 1*d.* related to a feed price of 27*s.* 7*d.* per cwt. On the basis of the current feed price of 27*s.* 11*d.* per cwt this guaranteed price is equivalent to 46*s.* 4*d.*	— 1*s.* 7*d.*	44*s.* 9*d.* related to a feed price of 27*s.* 11*d.* per cwt
Eggs—hen (per dozen)	3*s.* 8·86*d.* related to a feed price of 26*s.* 8*d.* per cwt. On the basis of the current feed price of 27*s.* 5*d.* per cwt this guaranteed price is equivalent to 3*s.* 9·36*d.*	— 1*d.*	3*s.* 8·36*d.* related to a feed price of 27*s.* 5*d.* per cwt

Table 3 (continued)

Commodity	(i) Guaranteed Prices 1964/65 determined after the Annual Review, 1964	(ii) Price change compared with the 1964 Annual Review Guarantee	(iii) Guaranteed Prices 1965/66 determined after the Annual Review, 1965
Eggs—duck (per dozen)	2*s.* 5·79*d.* related to a feed price of 26*s.* 8*d.* per cwt. On the basis of the current feed price of 27*s.* 5*d.* per cwt this guaranteed price is equivalent to 2*s.* 6·29*d.*	No change	2*s.* 6·29*d.* related to a feed price of 27*s.* 5*d.* per cwt
Wool (per lb)	4*s.* 7·25*d.*	No change	4*s.* 7·25*d.*
Milk (average per gallon)	3*s.* 4·85*d.* (c)	+ 1*d.*	3*s.* 5·85*d.* (c)

CROPS

Commodity	(i) Guaranteed Prices for 1964 Harvest determined after the Annual Review, 1964	(ii) Price change compared with the 1964 Annual Review Guarantee	(iii) Guaranteed Prices for 1965 Harvest determined after the Annual Review, 1965
Wheat (per cwt) (*a*)	26*s.* 6*d.*	— 1*s.* 1*d.*	25*s.* 5*d.*
Barley (per cwt) (*d*)	26*s.* 8*d.*	— 1*s.* 4*d.*	25*s.* 4*d.*
Oats (per cwt)	27*s.* 5*d.*	No change	27*s.* 5*d.*
Rye (per cwt)	21*s.* 7*d.*	No change	21*s.* 7*d.*
Potatoes (per ton)	280*s.* 0*d.*	+ 5*s.* 0*d.*	285*s.* 0*d.*
Sugar Beet (per ton, 16·0 per cent sugar content)	128*s.* 0*d.*	+ 2*s.* 6*d.*	130*s.* 6*d.*

NOTES ON PRICE TABLES

(*a*) The guaranteed prices for fat cattle, fat sheep and wheat are average prices subject to variation seasonally; the guarantee payments for some fat pigs are subject to variation according to quality; and the method of calculating the fat pigs guarantee payments involves an element of estimation. Because marketings and prices of fatstock and wheat may vary from those forecast, producers' average returns under the guarantees for those products in any year may differ slightly from the guaranteed prices.

(*b*) The guaranteed price for pigs is subject to the flexible guarantee arrangement.

(*c*) The guaranteed price for milk includes 0·25*d.* per gallon special assistance for compositional quality.

(*d*) The guaranteed price for barley is subject to arrangements whereby, to encourage a more even spread of marketings over the season, the deficiency payments are subject to premiums for barley delivered, after sale, in the later months of the cereal year and deductions for barley delivered in the early months of the year.

IN BRIEF

Twenty-five million by A.I.

Two-thirds of Britain's cattle are now bred by A.I. and almost entirely on farmer-cooperative lines. The total for the past twenty-one years is an impressive 25 million. To mark this achievement, a booklet *Twenty-five Million* has been published by the A.I. Organizations in England, Wales and Scotland.

Most striking of the changes in cattle breeding methods is the development of A.I. as a means of securing planned genetic improvement. At first it was thought that the general standard of cattle could be markedly raised simply by taking bulls from the elite pedigree herds and using them extensively on commercial herds through A.I. But early on the path for progress was seen to lie in the development of specific A.I. breeding programmes based on progeny testing; and these became possible because of the size of the A.I. operation.

The booklet emphasizes the value of the progeny test in the assessment of the potential milk yield, milk composition and conformation of a bull's daughters: 'The breeding worth of a bull can only be estimated indirectly on the qualities of either his ancestors (pedigree evaluation) or his descendants (progeny test). A progeny test based on more than about seven daughters for milk yield or four daughters for fat percentage will probably be more accurate than pedigree evaluation. The A.I. breeding programme is, therefore, based on the progeny test.'

The accuracy with which a progeny test predicts the performance of a bull's future daughters must be taken into account in evaluating a sire. In this context the booklet shows that an initial A.I. progeny test is a better measure of a sire's breeding worth for milk yield than an initial natural service test. Although the natural service test is a valuable indication of a bull's breeding worth, its accuracy must not be overrated. The booklet states, 'The considerably greater accuracy of the A.I. test is not generally appreciated by breeders. Many still prefer sires tested in natural service on a small number of daughters, possibly being misled by their often more spectacular—but less reliable—production figures.'

Milk composition and conformation are also considered in the context of progeny test assessment. Butterfat, which has a close relationship with total solids, is given considerable emphasis by A.I. organizations in the build-up of their studs. Environmental differences have considerably less effect on fat percentage than on milk-yield—consequently the daughter average is a satisfactory measure of a bull's breeding worth for fat percentage. Conformation is given particular attention by panels of breeders who inspect daughters of A.I. sires.

Looking to the future, the booklet states that progeny testing is only of practical value if the results are used intelligently to select sires for future generations of cattle.

The booklet is available free from the Milk Marketing Board, Thames Ditton, Surrey.

Dairy Herd at Auchincruive

Enthusiasm for the cubicle housing and the associated milking parlour, self-feed silage and barn-dried hay which makes up the new dairy system at the West of Scotland Agricultural College farm is no whit abated after a year's experience. This is clear enough from the College's Annual Report for the year ended September, 1964, issued recently. Milk yields and quality have been well maintained.

The Auchincruive design of cubicles (described in the April 1964 issue of *Agriculture*) has kept soiling to the minimum, with soiling by urine practically eliminated. 'With the improved design', they say, 'it has only been necessary to top up the sawdust in the cubicles once or twice a week. In the 40-cow unit, where the cubicles are 3 ft 9 in. wide, the sawdust requirement averaged 12 lb per cow per week, whereas in the 57-cow unit with cubicles 3 ft 6 in. wide, the sawdust requirement was reduced to 8 lb per cow per week. On average, two to three bags of sawdust were required to keep one cow clean and well bedded for the winter period.

'The handling of the large quantities of slurry produced by the dairy cows has become a routine operation. Altogether, approximately 575,000 gallons have been spread on 176 acres since the cubicles came into use in December, 1962. The carting and spreading has been carried out with a 500 gallon capacity tractor-drawn vacuum tank.

'The slatted passageways between the cubicles, the slatted storage tanks in the collecting yards, and the tanks at the silos have a total capacity of approximately 54,600 gallons. This provides storage for six to eight weeks in the winter period, thus making it possible to choose reasonably suitable weather for applying the slurry to the land. The slats covering these channels and tanks are of concrete. The top surfaces have a dusting of carborundum and are specially "ribbed" to prevent cows slipping. Finished to our own specification, this surface has proved very effective, and during two winters with the cows on these slats there have been no mishaps and foot troubles have been eliminated.

'Most of the slurry has been applied to stubble in the winter months and on grassland in the early spring and summer periods. Pastures treated with slurry have been grazed by the dairy cows within three weeks from the date of application.'

A limited number of copies are available from the West of Scotland Agricultural College, 6 Blythswood Square, Glasgow, C.2.

The Coming of the Conifers

Dartmoor Forest must always have contained large tracts of open moorland. In prehistoric times woodlands probably occured mainly in the lower fringes of the moor where valleys, carved out of the softer strata around the central granite boss, provided better drainage and some shelter for such broad-leaved species as oak, alder, rowan, willow, hazel and holly. When, in 1204, the remainder of Devon county was disafforested these woodlands, the haunt of red deer, were preserved as a Royal Forest and later annexed to the Duchy of Cornwall.

This and many other observations on the history, scenery, and archaeology of Dartmoor, with an account of its afforestation in modern times, will be found in a new Forestry Commission booklet *The New Forests of Dartmoor**. Lovers of the moor will recall the subjects of many of the excellent photographs used to illustrate it.

Re-afforestation began early in the nineteenth century with the planting of trees as shelter-belts around houses and farm buildings. Conifers such as pine,

*Forestry Commission Booklet No. 10. H.M. Stationery Office. 2*s.* 6*d.* (by post 2*s.* 10*d.*)

spruce and larch were used as well as the indigenous broad-leaved species, and the success of these conifers on the moor caused them to be used on an increasingly wide scale.

The need to maintain the nation's supply of timber during World War I and to provide local employment in the post-war years, gave further impetus to planting. On the advice of the Forestry Commission, the newly-introduced Sitka spruce was used to replace the less vigorous Douglas fir. By 1930 the Duchy had planted some 1,200 acres of Sitka spruce (on which much work on the nutrition of seedlings has been done at Rothamsted). Later, the Forestry Commission bought these, along with other extensive plantations. It now manages 4,700 acres within the Dartmoor National Park, of which a useful map is included in the booklet.

Sitka spruce is now being planted up to the 1,650 ft contour, thanks to the construction of roads for the extraction of timber and to modern cultivation machinery.

An interesting point is that whereas in the distant past the hut circles and mounds which abound on the moor were unwittingly disturbed by farmers looking for handy gateposts and shelters, the new planting has been done round these relics, and the tree canopy has prevented their being smothered by undergrowth. Ecologists will be interested to learn that the descendants of edible snails introduced by prisoners from the Napoleonic wars in what is now a civil penitentiary, were discovered by the Commission near Princetown in 1935—but there are none to be found now.

Production of Dartmoor timber from Commission plantings was 119,000 cu. ft in 1964, and it is estimated that by the end of the century this will have increased to 750,000 cu. ft, representing full-time employment for 160 men. In addition to Forestry Commission plantings, many landowners have planted trees as a cash crop and to provide local employment. The eventual total output from these private enterprises, which employ about 120 men, is very likely to exceed that of the Commission's plantings.

A. J. L. Lawrence

Colorado Beetle in 1964

For the twelfth successive year, no breeding colony of Colorado beetle was found in England and Wales in 1964. Eighteen colorado beetles were, however, found in various situations between 23rd April and 3rd September, mostly during July and August.

Two live beetles were on imported produce, one on endive from France and one on melons from Spain. Twelve, including three crushed ones, were on ships bringing mixed cargoes (mostly non-vegetable) from Portugal; the dead beetles were thought to have been killed accidentally during the voyage. Three live beetles were found by people who had recently returned from holiday in France, one in a car (Middlesex), one in camping equipment (London), and one on a kitchen floor having, presumably, crawled or fallen from baggage (Staffordshire). The remaining beetle was discovered on an empty lorry in Bradford, which had carried vegetable produce from London and delivered in Lancashire and Yorkshire.

Colorado beetle continues to spread in Europe. Reports from the European and Mediterranean Plant Protection Organization record the beetle in the 'heel' of Italy in the Lecce area, and in Russia in the southern Ukraine regions of Nikolayev and Kirovograd.

The Ministry again thanks all those who reported and sent in Colorado beetles. There is still need for the utmost vigilance if this pest is to be kept under control.

Books

The Law of Agricultural Holdings (4th Edition). W. S. SCAMMELL. Butterworths. 77*s.* 6*d.*

Not many legal authors enjoy the distinction of their names being accepted as part of the English language; and alas on the rare occasions when this happens, the distinction is all too often posthumous. To this select coterie, which includes such well-known names as Chitty (on Contracts), Salmond (on Tort) and Woodfall (on Landlord and Tenant), must now surely be added—and happily still in his lifetime—Scammell (on Agricultural Holdings).

Until an opportunity occurs to consolidate the various Acts of Parliament relating to agricultural holdings, the statute book must continue to present an untidy appearance. Although the bulk of the law is still to be found in the Agricultural Holdings Act 1948, this Act was extensively amended by the Agriculture Act 1958, and has since been further amended by section 19 of the Agriculture (Miscellaneous Provisions) Act 1963. Moreover, for certain limited purposes, it is still necessary to refer to the Agriculture Act 1947, which introduced the original far-reaching post-war reforms.

The virtue of 'Scammell' is that the reader can readily see the effect of the 1948 Act as subsequently amended, and from this proceed to digest at his leisure not only the relevant case law which is assembled for his benefit, but also the author's stimulating personal comments on it. Mr. Scammell has thus followed the plan of the third edition, but in the present issue he has wisely decided to jettison all but vestigial traces of the 1947 Act—which, since its dispossession teeth were drawn in 1958, can no longer be of interest to the general reader.

The principal innovations in this edition are the author's commentary on section 19 of the 1963 Act (which restricts the operation of certain notices to quit), and on the Agriculture (Notices to Remedy and Notices to Quit) Order 1964, both of which are reproduced in full. There is also a useful chapter on other recent agricultural legislation. This includes Part III of the Land Drainage Act 1961, which seems likely to assume considerable importance in relation to farm ditches, that vexed and perennial problem among neighbours. As was to be expected there are the usual erudite analyses of the more recent court cases, of which the decisions in *Gladstone v. Bower* (1960) and *Bernays v. Prosser* (1963) are among the most important.

A high priority must continue to be given to 'Scammell' by the country practitioner—whether he be lawyer or land agent—and, indeed, by all who directly or indirectly earn their living by the land.

G.F.A.

Seasons and Prices. E. L. JONES. George Allen and Unwin. 28*s.*

Every farmer knows only too well how weather can influence the financial returns he receives from his crops and livestock. Whether it be good or bad, there is no doubt that it is a powerful economic agent, and it was more so in the eighteenth and nineteenth centuries. This is the period chosen by Dr. E. L. Jones of Nuffield College, Oxford, to assess the impact of the elements on agricultural production.

He rightly points out that the few other studies previously made in this field of work have been chiefly concerned with harvest fluctuations of crops. In order to achieve a more balanced perspective, Dr. Jones paints on a broader canvas, by dealing with weather influences on rural dwellers, livestock as well as crops.

In sheep production, wet weather in summer had a twofold effect; shortage of good hay caused a loss of condition and often abnormally heavy seasonal sales, with consequent price falls. Secondly, these conditions favoured the spread of liver fluke, a sheep killer in the nineteenth century. Thus in 1879-91 it was estimated that some six million sheep died, compared with an average of about one million. Sheep were, in fact, rather susceptible animals to weather hazards both as regards population and price.

Cattle did not suffer from fluke to the same extent as sheep. Fodder supplies were rarely acute enough to warrant mass autumn slaughterings, and so prices rather than populations were the victim of weather. In the severe winter of 1859-60,

for instance, rotted roots and widespread flooding glutted the Hereford Easter Fair with lean cattle; fat cattle, by contrast, rose in value because fewer beasts were fattened. On the other hand, economic distress also occurred in many years of abundant harvests and thriving livestock. A small surplus caused price falls out of all proportion to the size of the surplus.

It is, therefore, not surprising that many protective devices were developed to counteract the extremes of weather. A range of fodder crops—rye, swedes and turnips—kept livestock in better winter condition; irrigation helped to offset the effect of drought, while harvesting of hay and corn were speeded up by better equipment like mowers, reapers and the horse-drawn binder.

Dr. Jones ends by providing a summary of the effects of inclement weather from 1728 to 1911, based partly on the observations of T. H. Baker, whose *Record of the Seasons* (published 1883) was the standard work, and partly on the author's own insertions. This is a well-written and informative book, which helps to fill a gap in our economic history.

H.E.

Animal Genetics. F. B. HUTT. The Ronald Press Company, New York. $12.

This is basically a text-book which takes the student from simple concepts through to many aspects of modern genetics. The detailed and carefully thought out explanations of the many complicating features of genetics, such as those associated with gene interaction, linkage, sex-linkage, maternal effects and hybrid vigour, lead the reader on rather than deter him, so that even those with only an elementary knowledge of the subject are unlikely to be daunted. The problems sections, which follow each chapter, are well conceived and contain many stimulating ideas. Because the many examples of inherited effects discussed are drawn largely from domestic animals, this is also a useful reference book for anyone concerned with animal breeding.

The author is Professor of Animal Genetics at the New York State College of Agriculture, Cornell University, and the happy combination of his scholarly and readable style with his valuable collection of information on the genetics—particularly veterinary genetics—of domestic farm animals makes this a book which should be widely available in agricultural libraries. Although not primarily set out for easy reference, the comprehensive subject index is adequate, and the bibliographies selective.

With books of this kind it is not difficult to find points of criticism. In this case the most notable is the little attention paid to population genetics, and I feel that this receives unduly harsh treatment at Professor Hutt's hand. Certainly, we should be critical of much that has been published on theoretical population genetics in recent years. Nevertheless, the concept of heritability figures prominently in modern animal breeding programmes and deserves more attention.

It is also a pity that, after illustrating polymorphism in some detail, Professor Hutt does not go on to develop the evolutionary significance a little more and to relate this to the problems involved in the breeding of more profitable domestic animals. It is unfair, however, to expect a book on animal genetics to delve deeply into animal breeding.

As both a text-book and a source of information on farm animal genetics, it is to be thoroughly recommended, provided the reader remembers that modern quantitative genetics is by no means adequately covered. To fill this gap the author suggests the excellent book by D. S. Falconer, *Introduction to Quantitative Genetics*, which might almost be said to form a companion volume.

C.M.H.

Farm Machinery—Operation and Care. J. C. TURNER. Cassell. 18*s*.

The title of this book holds out promise and hope to all who are interested in the better use of farm machinery, whether they are farmers, tractor operators, lecturers or students. Most of these groups will, however, be disappointed, for it is clearly stamped as being a general introduction to farm machinery for first-stage students.

It is obviously the work of an educationist who has lectured to students on a national syllabus, and many of the diagrams indicate the sort of simplified drawing which can easily be used on a blackboard.

The arrangement of the book and planning of the chapters are good and, together with the diagrams and easy style, make a readable book and one easy to follow.

General treatment is superficial, as it is bound to be when the principles of the engine, tractor layout, the different types of field machines, barn and dairy machinery are covered in 185 pages of fairly large type. The principles of the engine and description of the tractor take up one-quarter of the

pages and one-fifth of the chapters, and this forms the best section of the book. It gives a good introduction to the working of spark and compression ignition engines and describes transmissions, differentials and differential locks, as well as tractor wheel adhesion devices.

In the field machinery sections the author claims he is explaining only general principles, not attempting to give instruction on individual makes or models. This part is composed of clear descriptions of various machines. In most cases there is no attempt to relate the machine to the job it has to do in the field and very rarely is any guidance given of field setting, operation or maintenance routines. Storage procedures are glossed over; for information on all practical matters the reader is referred to individual makers' instruction books.

Some obvious omissions from the book are the subjects of crop drying and storage which are now assuming quite a large part of farm mechanization, materials handling and the mechanical feeding of livestock. In the sugar beet section, precision drills and down-the-row thinners get a mention, as they justly deserve, but there is no reference to cleaner loaders which are now finding their way on to every farm where this crop is grown.

To the first-year student at a Farm Institute or one taking a part-time course, this book will start him off well on his study of farm machines and the pattern of farm mechanization. It is a good, quick, readable introduction to the subject and should encourage students to seek more knowledge and detailed information from other sources.

F.L.G.

The Lily Year Book, 1965. ROYAL HORTICULTURAL SOCIETY. 15*s*.

The twenty-eighth *Lily Year Book* is dedicated to Mr. A. Simmonds, Secretary to the Society's Lily Committee from 1931 and a leading organizer of the Lily Group's activities. The book can be read as an epitome of his work and that of the Group.

Priority is given to the lily as a garden plant, although accounts of displays at shows reveal and underline the wide range of lilies now available. Lilies growing not only in England but in the United States, Canada, Australia and Eire are evidence of the far-reaching effects of the Group's influence. While interest in Lily species is by no means exhausted—those of China, Iran and U.S.A. are dealt with in this issue—hybrids, barely existing before 1931, naturally take pride of place. Hybridization, now the lily enthusiast's hobby, was the subject of a talk by Mr. J. Newell of the John Innes Institute which, with the ensuing discussion, have most usefully been reported as part of the Group's policy of disseminating knowledge.

Another activity, aimed at raising the standard of health of lily stocks, has been to encourage the growing of lilies from seed. Much helpful information about this is contained in a note of a discussion by Mr. G. Darby. But one doubts the wisdom of placing on record the disastrous results arising from failure to distinguish between entomologists and plant pathologists when manning a brains trust.

The Group's interests range beyond the genus *Lilium*. Other members of the *Liliaceae* also receive attention, including the beautiful Nomocharis, and there is a general survey of garden-worthy liliaceous plants contributed by Mr. G. S. Thomas.

This volume is liberally illustrated, with both black-and-white and coloured plates, several of which are of great merit. The possessor of the book will find himself admiring the good year's work by an enthusiastic group, stimulated to further effort and with a useful work of reference to place on his shelves.

K.H.J.

A Bibliography of Farm Buildings Research. Part V—Buildings for the Drying and Storage of Grain, 1st Supplement, 1958–1961. Agricultural Research Council. 2*s*. 6*d*. (by post 3*s*.)

The main objects in drying and storing grain are to get rid of water, prevent its re-absorption, and guard against fungi, insects, rodents and the like. It is comforting to learn from this supplement that what we do is about right.

However, anybody who picks it up expecting to find a lot of detailed information about buildings for grain is going to be disappointed. This is a publication for the research worker and farm building designer rather than the general reader. It contains notes on research work and experiments throughout the world into the very important and complex problems of grain drying and storage.

One message stands out—that buildings are a means to an end, not an end in themselves, a truism invariably overlooked.

A worthy addition to a worthy series.

C.R.

The Ministry's Publications

Since the list published in the March, 1965, issue of *Agriculture* (p. 141) the following publications have been issued.

BULLETINS

No. 178. Beef Production (Revised) 5*s*. (by post 5*s*. 5*d*.)

There has been a material change in the technique of beef production during recent years. This bulletin has been revised to cover the important features of market requirements, genetic aspects of breeding, nutrition, breeding for beef, rearing, cattle fattening, and the economics of the industry.

ADVISORY LEAFLETS

No. 34. Plum Aphids (Revised)
No. 87. Celery Fly (Revised)
No. 93. Brucellosis (Bovine Contagious Abortion) (Revised)
No. 104. Pig Feeding (Revised)
No. 408. Kale as a Feedingstuff (Revised)
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No. 492. The Saw-Toothed Grain Beetle (Revised)

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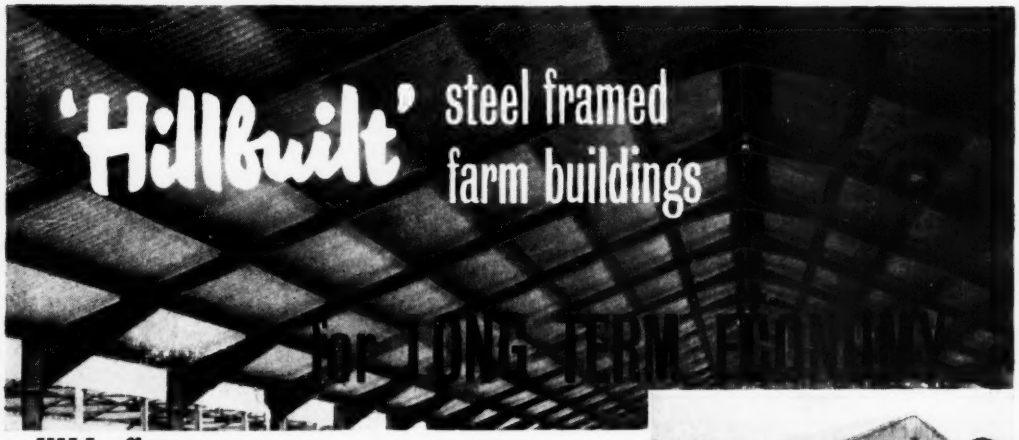

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